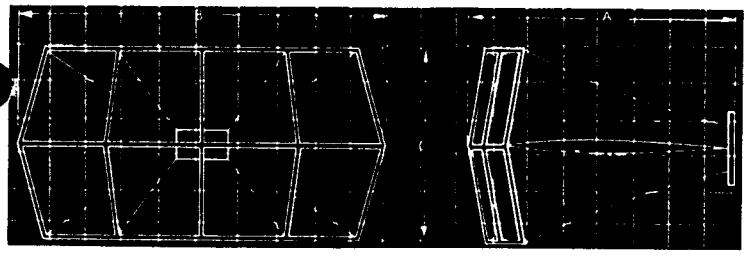


ALTEC ENGINEERING NOTES

TECHNICAL LETTER 242

APPLICATIONS FOR THE ALTEC LANSING 1690 MIXING CONSOLE

BY
CHRIS FOREMAN

INTRODUCTION

The Altec Lansing 1690 is a compact, efficient and versatile mixing console. It is one of the most advanced electronics products ever designed by Altec — advanced in terms of its mechanical and circuit design and its human engineering. The 1690's most important advance, however, is in its functions — functions and capabilities that make a more conventional mixing console seem limited by comparison.

Conventional mixing consoles in the 1690's size and price range are designed for one type of system such as sound reinforcement. These conventional consoles may have features which allow them to operate in other types of systems — provided that you will accept compromises in the system's capabilities or its ease of operation.

The 1690, on the other hand, adapts readily to the functional requirements of many different types of systems — *virtually without compromise*. Having a 1690 is almost like having several different mixing consoles ready to switch into the circuit as you need them. This adaptability is due to an innovative yet simple feature: the input channel **MODE SWITCH**. The eight MODE switches (one per input channel) actually alter each individual input channel's block diagram to optimize it for sound reinforcement, recording or mixdown type functions.

This tech letter takes a detailed look at the 1690's block diagram, how the eight MODE switches alter the block diagram and how you might design and operate different types of sound systems using the 1690. As you will see, the possibilities are numerous and exciting.

In order to take full advantage of the 1690's potential, we recommend that you study both this tech letter and the 1960 Operating Instructions. The 1690 Operating Instructions will acquaint you with the basic functions of the front panel controls and switches, and explain how to connect various source, load and effects devices to the 1690.

UNDERSTANDING THE 1690's BLOCK DIAGRAM AND THE MODE SWITCH

The input channel Mode switch has three positions: "PA", "REC", and "MIX". The "PA" mode is optimized for sound reinforcement, the "REC" mode is optimized for recording and the "MIX" mode is optimized for mixdown (multi-track to one or two-track tape formats). These three designations are *descriptive* of potential applications, but not *limiting. Don't let the labels limit the application!* There will be occasions where a sound reinforcement system works best with the MODE switch in the MIX position. Sometimes you may do a recording with the MODE switch in the PA position. In other words, use the MODE that works best for each application!

DEFINITION OF TERMS: Source and Load

The term "source", as used in this tech letter, refers to any device which supplies a signal to one of the 1690's inputs. Thus, a microphone plugged into the Channel Balanced input is a source. A tape recorder whose output is plugged into the Channel Line input is also a source. The term "load" refers to any device which receives a signal from one of the outputs of the 1690. Thus, an equalizer, connected to one of the 1690's Program outputs, is a load. A tape recorder, plugged into the 1690's Program Left Line output, is also a load. By these definitions, the input of the 1690 is a "load" to a source device.

STEP-BY-STEP DISCUSSION OF THE 1690's BLOCK DIAGRAM

Overall

Figure 1B is a block diagram of the 1690. Only one of the eight Input Channels is shown. All eight Input Channels are the same. To the right of the Input Channels, near the center of the block diagram, are the four Mixing Buses (vertical lines). The Program and Monitor Outputs, and other functions are drawn to the right and below the Mixing Buses.

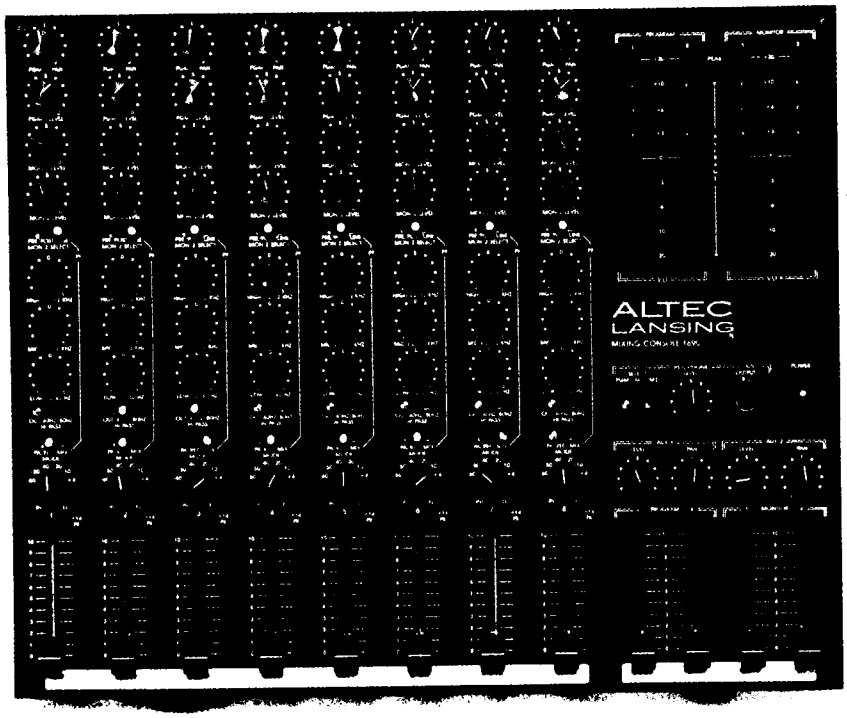


Figure 1A: 1690 Front Panel

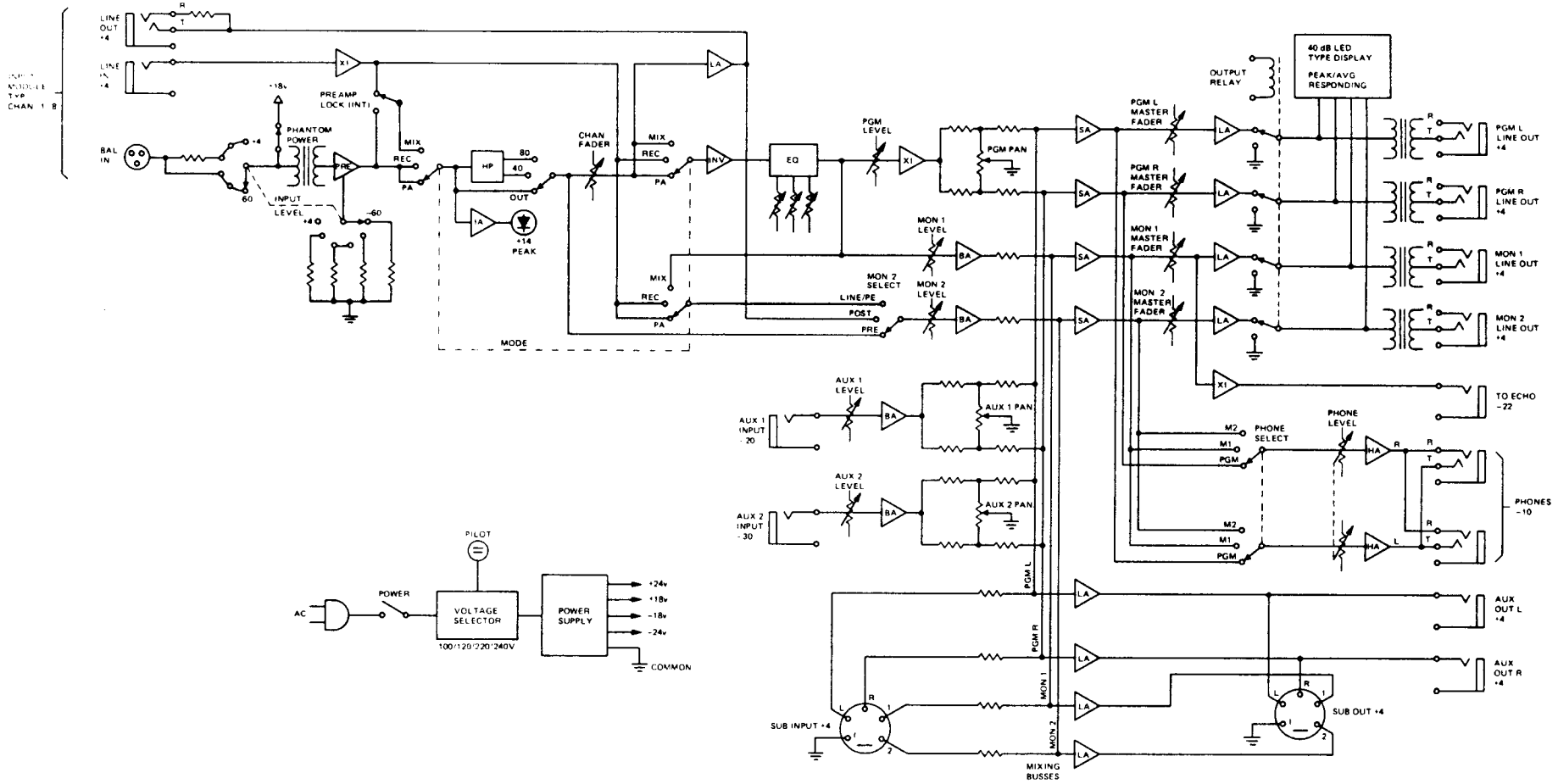


Figure 1B: 1690 Block Diagram

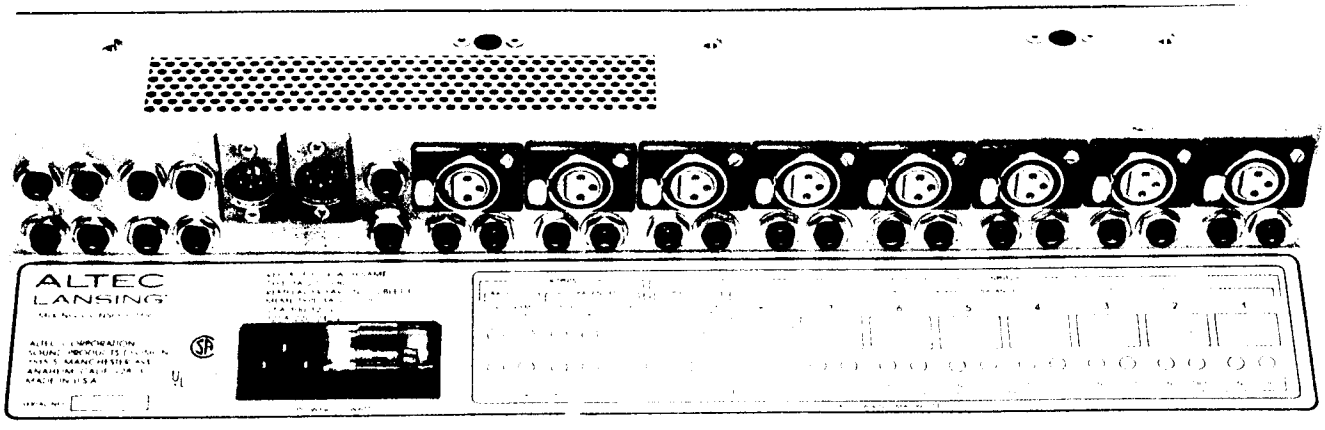


Figure 1C. 1690 Rear Panel

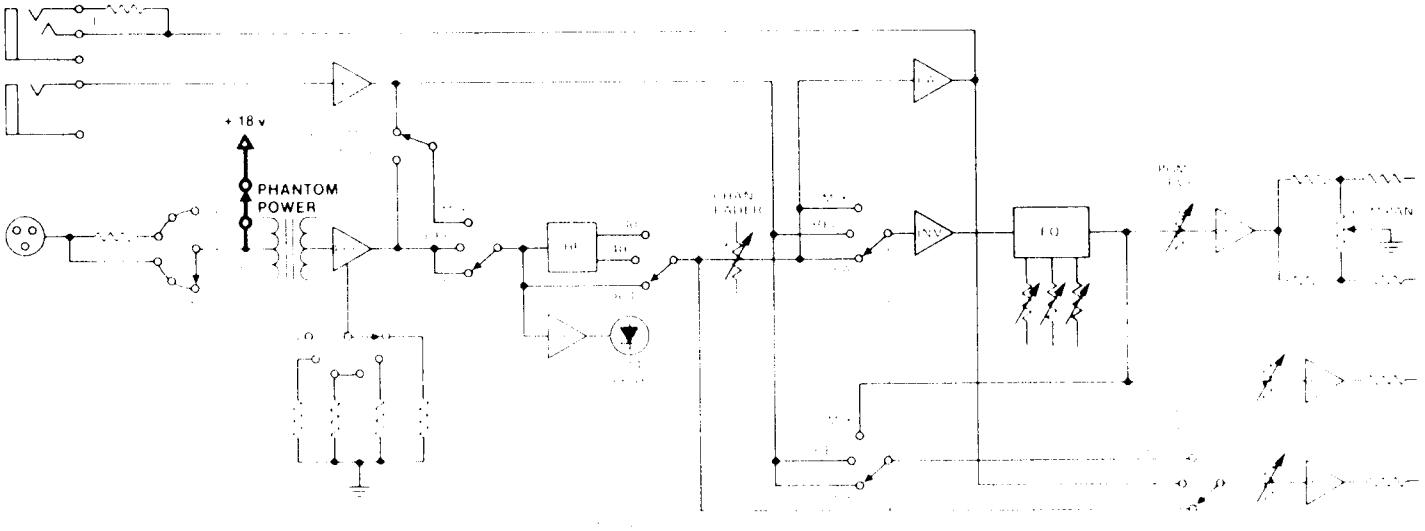


Figure 2. Phantom Power Switch

Input Channel Phantom Power, and Input Level Switch

The Phantom Power switch and input transformer are located just to the right of the Balanced input. Since any phantom power supply can cause noises when connected to a fault, cable or an unbalanced microphone, it's a good idea to turn the 1690's Phantom Power "off" when it is not needed. Note that each of the 1690's eight Input Channels has its own Phantom Power switch, accessible on the front edge of the chassis, by removing the Wrist Pad.

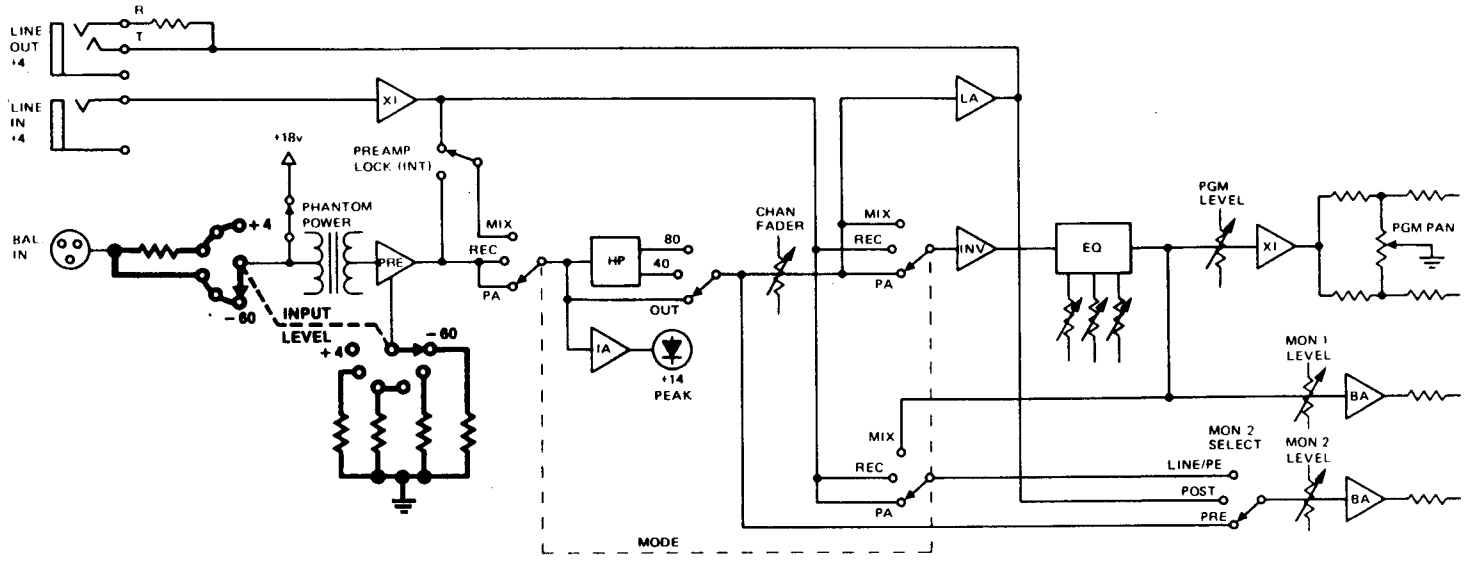


Figure 3: Input Level Switch

The Input Level switch, located just to the right of the input transformer, is a two-section input-pad/preamp-gain switch (note the dashed line connecting the two sections). On the 1690's front panel, the Input Level switch is calibrated in dB of *expected input level*, not dB of input pad. Thus, the "+4" position should be used for sources which have a nominal +4 dB (1.23 volt) output level (a "line-level" source). The "−60" position should be used for sources which have a nominal −60 dB (775 microvolts) output level (a low to medium-level microphone).

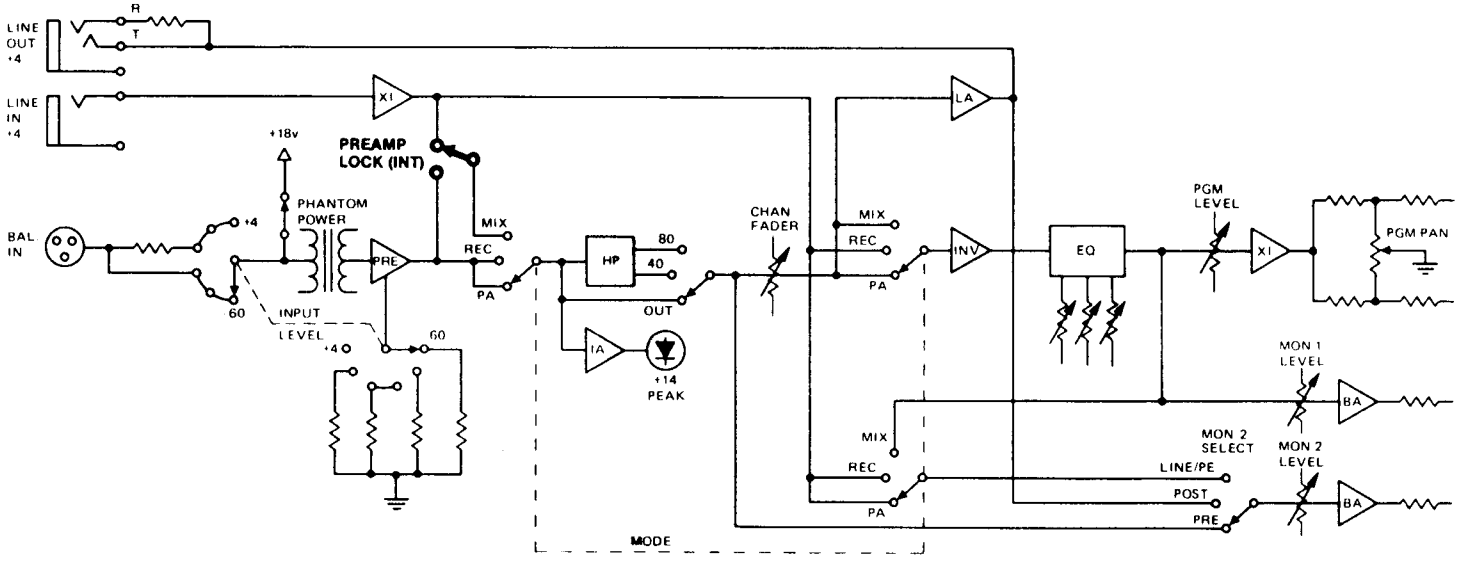


Figure 4: Preamp Lock Switch

Preamp Lock

Immediately following the Channel Preamp is a switch called "Preamp Lock" which is located on the Input Channel pc board (no front panel access). The Preamp Lock switch routes the signal from the Balanced input to the Input Channel circuitry even when the MODE switch is in the MIX mode.

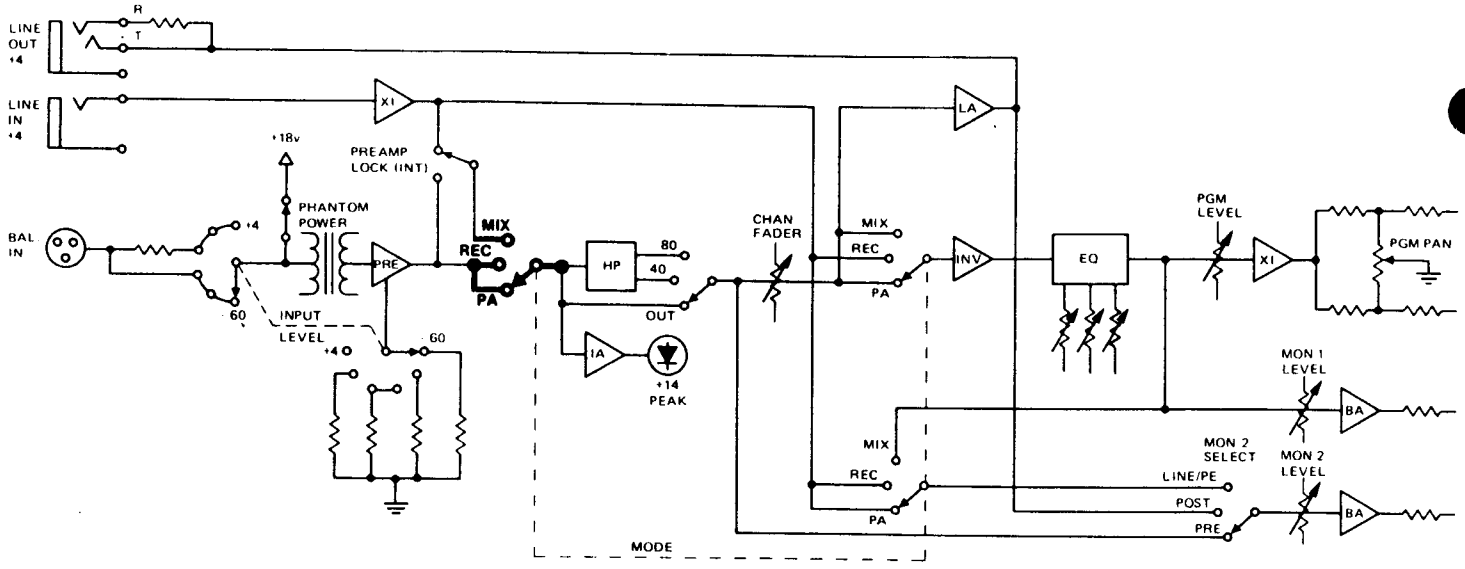


Figure 5: MODE Switch, Section 1

MODE Switch, Section 1

Just to the right of the Preamp Lock switch is the first section of the MODE switch. At this point, the MODE switch selects the signal from either the Balanced input (XLR) or the Line input (phone jack) and routes this signal to the rest of the Input Channel circuitry. In most sound reinforcement and recording applications, the source will be a microphone or high-level balanced device. For this reason, in both the PA and REC positions, the MODE switch selects the Balanced input. If the source is a line-level, unbalanced device, the MODE switch may be placed in the MIX position to accept a source plugged into the 1690's Line input. Since the Line input is a high-impedance input, it should be used for line-level sources which require a high-impedance load.

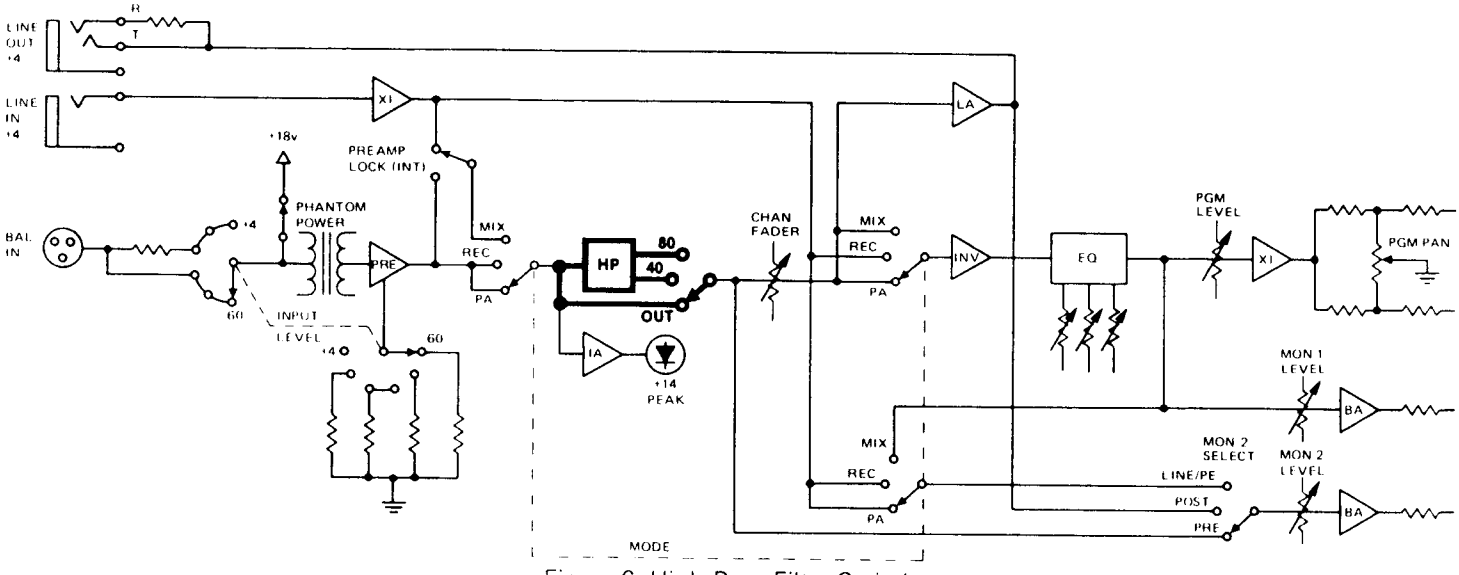


Figure 6: High-Pass Filter Switch

High-Pass Filter Switch

Following the first section of the MODE switch is the Input Channel High Pass filter. In most systems, the High Pass filter should be used in the "40" or "80" position to attenuate unwanted low-frequency signals from dropped microphones, air-conditioners or other sources. In some recording or discotheque applications, you may wish to use the High Pass filter in the "OUT" position.

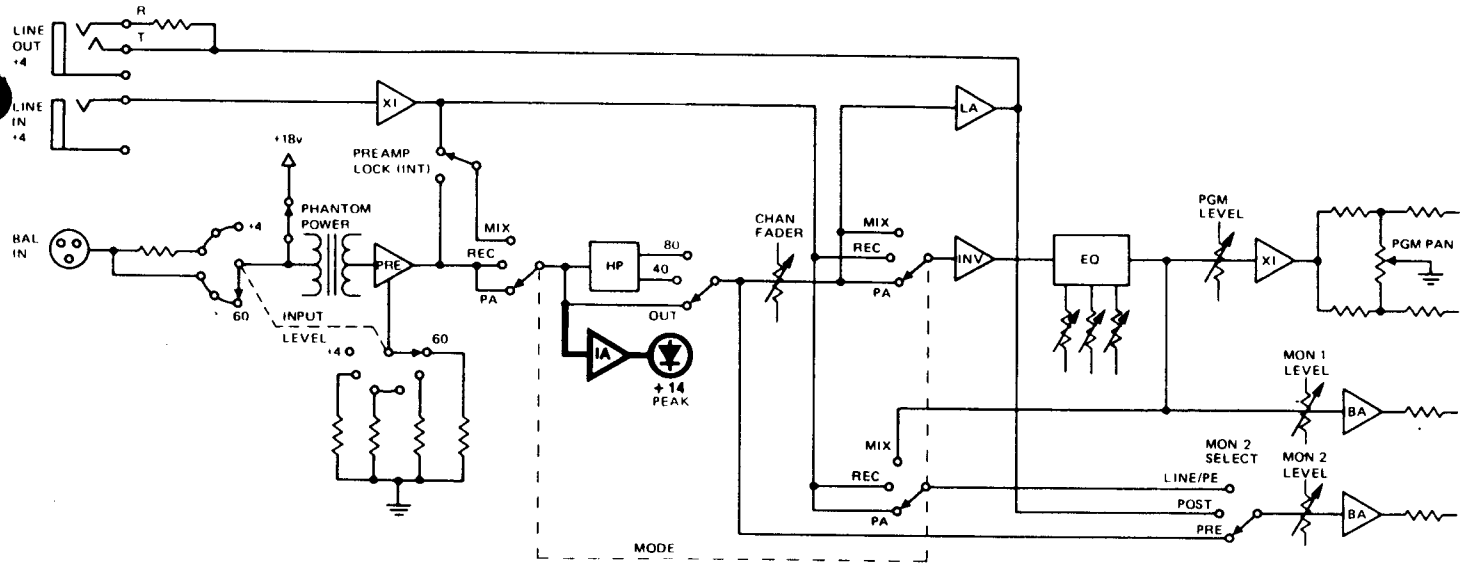


Figure 7: LED Peak Indicator

LED Peak Indicator

The LED Peak Indicator *is not a clipping indicator*. The LED turns on when it senses a momentary or sustained level of +14 dB (3.88 volts) at the output of the Input Channel Preamplifier (notice the "take-off" point for the LED in the block diagram). At this point, *there is still a full 10 dB of headroom* left in the Input Channel Preamplifier. Thus, the LED Peak Indicator *should light occasionally* during normal program material. If the LED lights continuously, the Input Level switch needs to be set to a higher expected input level. If the LED does not light even on program peaks, the Input Level switch needs to be set to a lower expected input level.

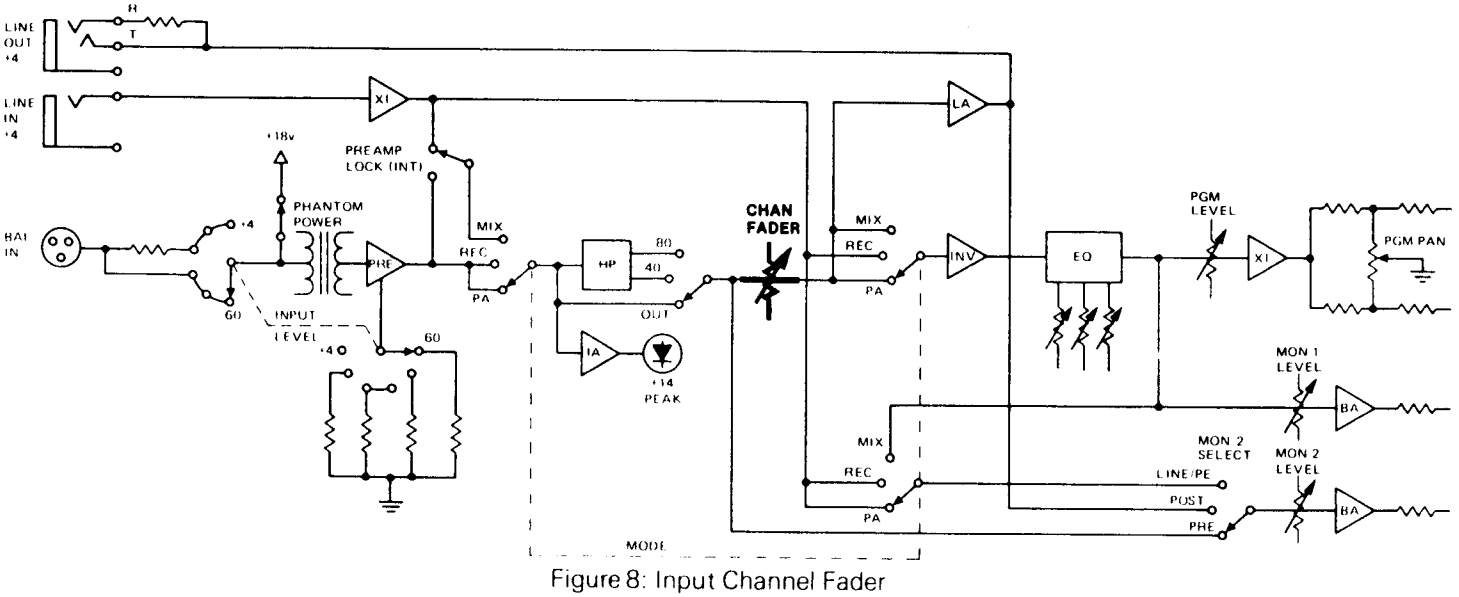


Figure 8: Input Channel Fader

Input Channel Fader

Following the High Pass filter is the Channel Fader. This is the slide-type volume control located on the front panel. In most systems, the Channel Fader will be the main volume control for each Input Channel. In some systems the Program Level control will be the main volume control for each Input Channel.

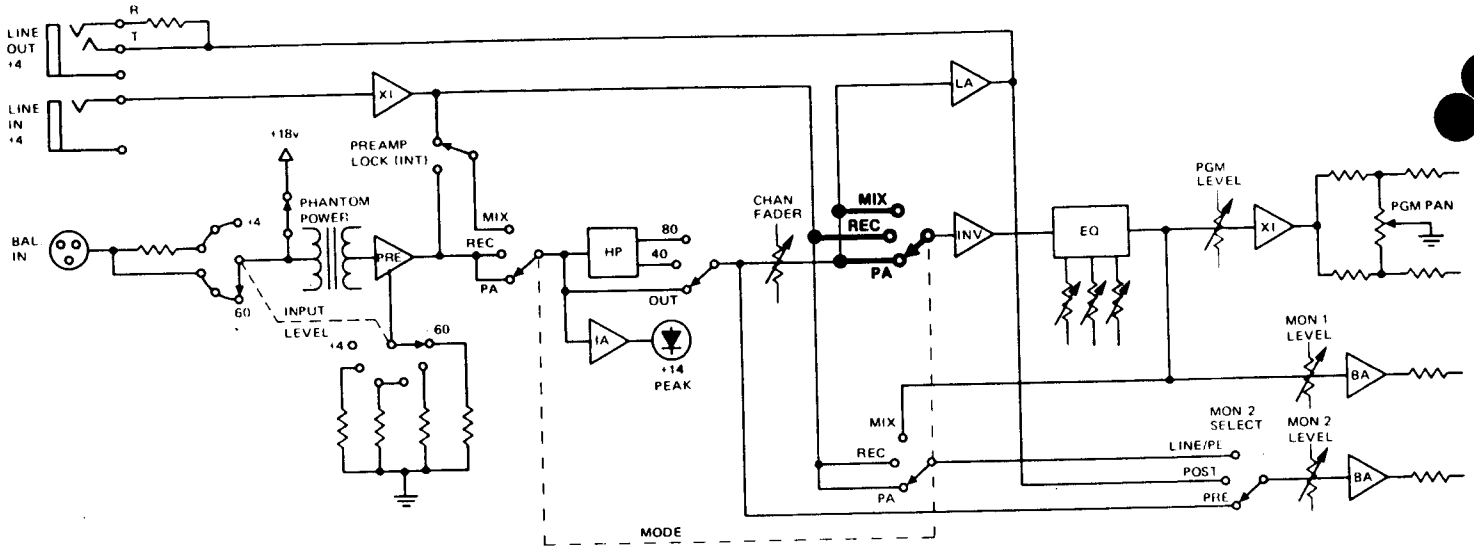


Figure 9: MODE Switch, Section 2

MODE Switch, Section 2

Following the Channel Fader is the second section of the MODE switch. This section selects the source for the following Input Channel circuitry. In the PA and MIX modes, the MODE Switch selects the signal from the Channel Fader. In the REC mode, the MODE Switch selects the signal from the Line input. This corresponds to a recording setup where the Line input would receive the output from a tape recorder's line output.

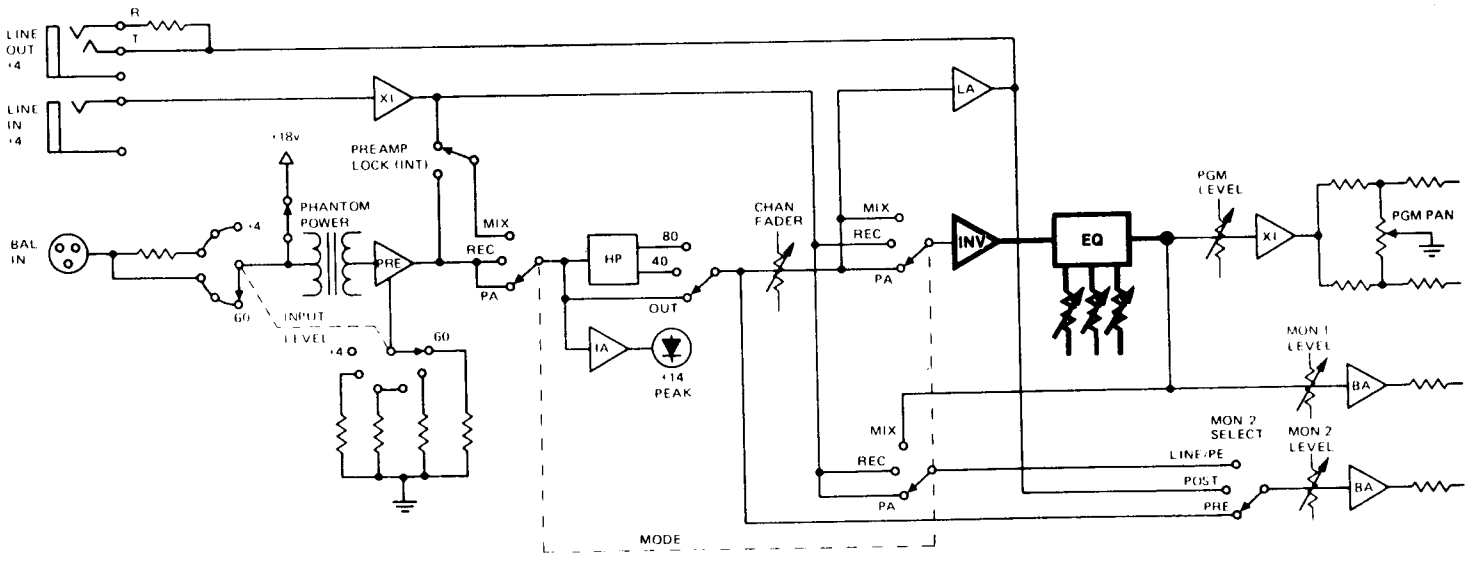


Figure 10: Input Channel Equalization and Buffer Amplifier

EQ and Buffer Amplifier/Line Output

Following this section of the MODE switch, the signal flows through an inverter/buffer amplifier and through the EQ circuitry. Note that the Line output, fed by another (non-inverting) buffer amplifier, always receives its signal from the Channel Fader. Depending on the setting of the MODE switch, this signal may originate at the Line input or the Balanced input.

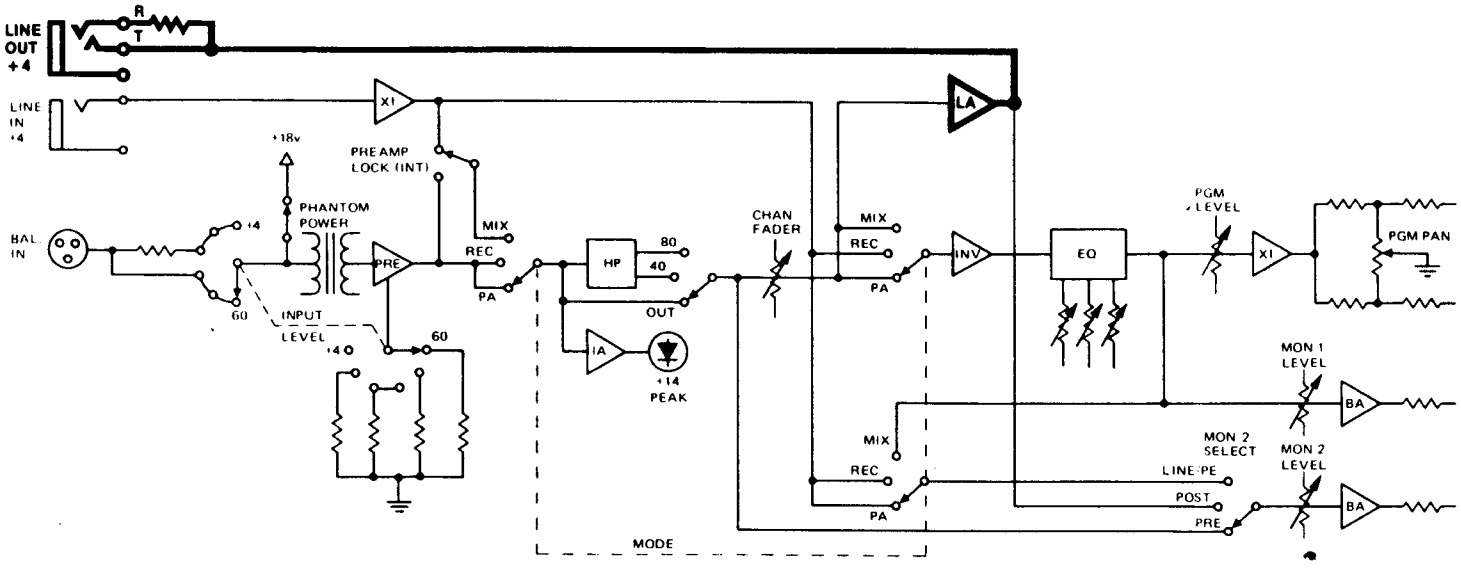


Figure 11: Input Channel Line Output Jack

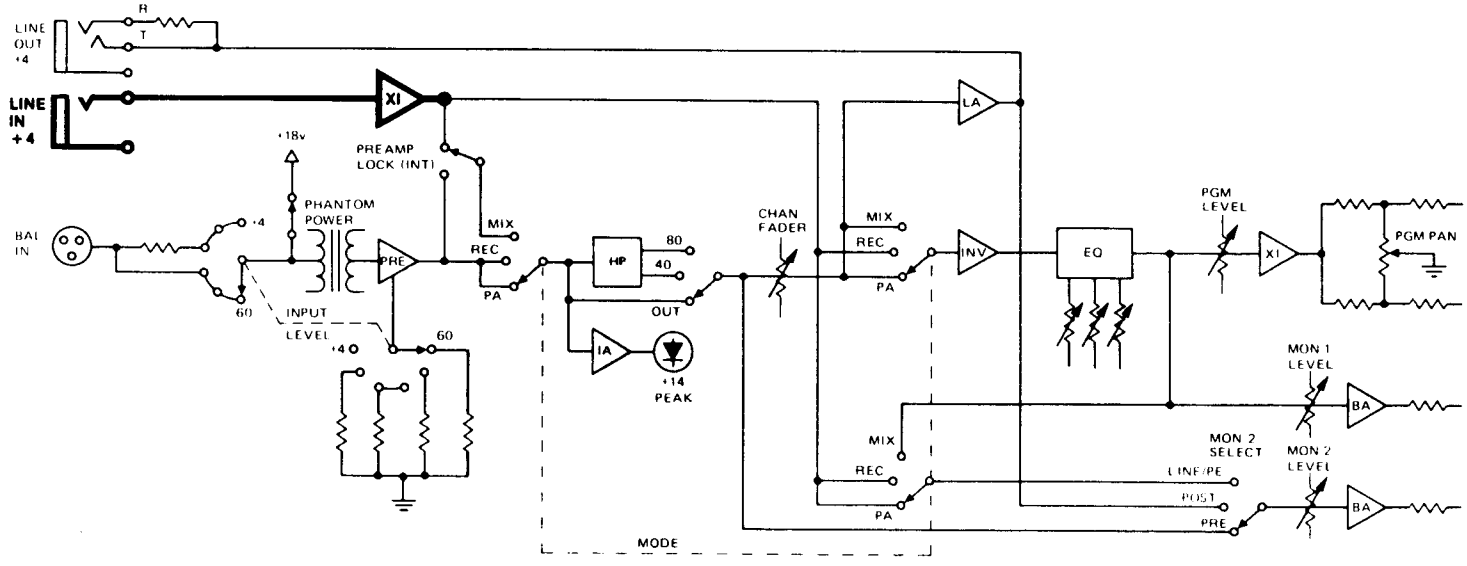


Figure 12: Input Channel Line Input

Line Input

The Line input is an alternate to the Input Channel Balanced input, although in some systems, both the Line input and the Balanced input are used. The Line input normally feeds its signal to all three sections of the MODE switch. If the Preamp Lock switch is IN, the Line input cannot feed the first section of the MODE switch.

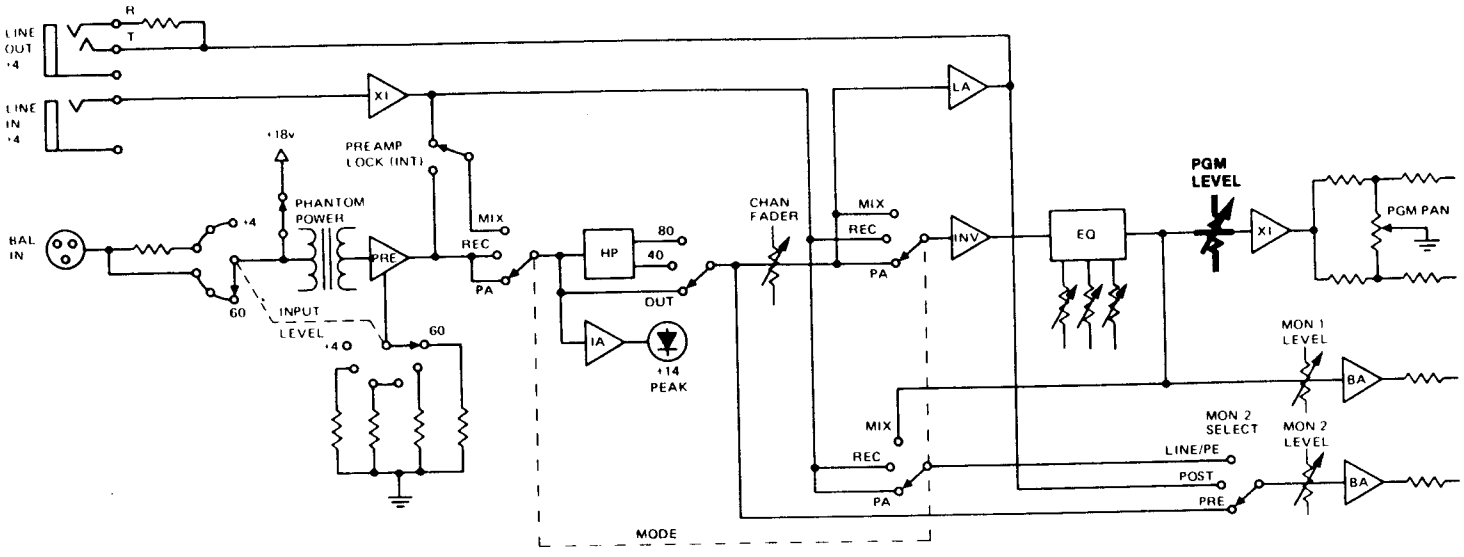


Figure 13: Program Level Control

Program Level Control

Past the EQ circuitry, the signal flows through the Program Level control. The Program Level control performs the same function as the Channel Fader, but at a different point in the Input Channel circuitry. The Program Level control should be left in the fully clockwise (all the way up) position unless it is specifically needed for a special mixing function.

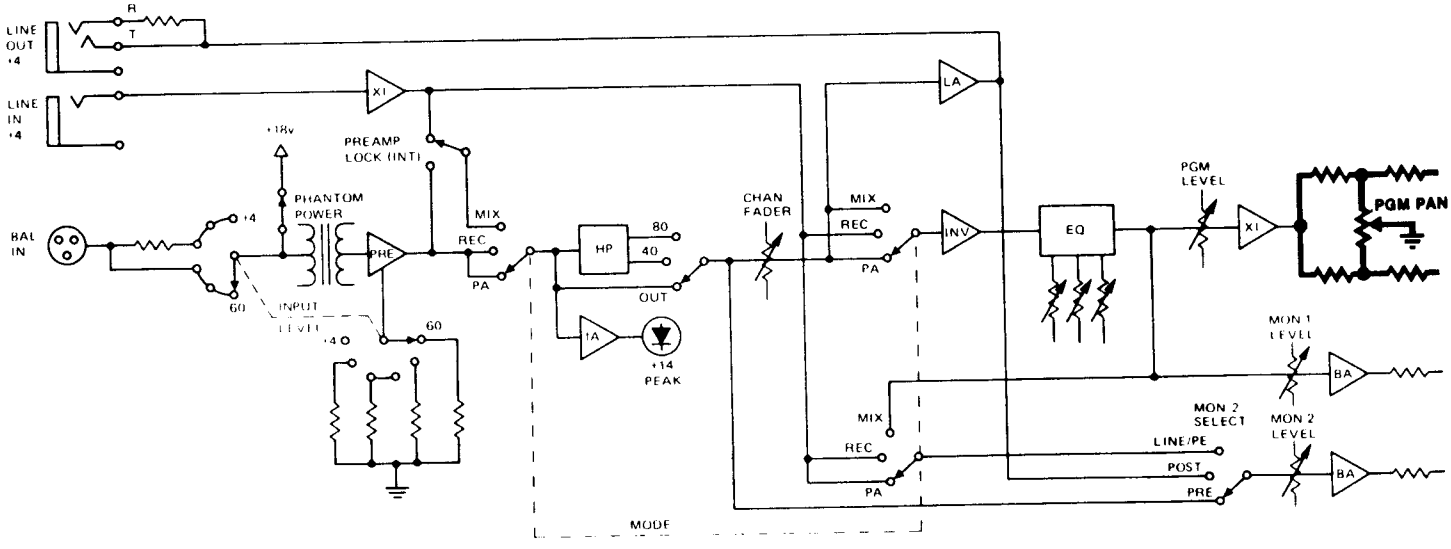


Figure 14: Program Panning Control

Program Panning Control and Program Mix Buses

Following the Program Level control, the signal flows through another buffer amplifier to the Program Panning control and out to the main Program Mix Buses. All eight Input Channels are mixed onto the main Program Mix Buses. From here, the mixed signals pass through buffer amplifiers, master faders, output relays and output transformers to the 1690's outputs.

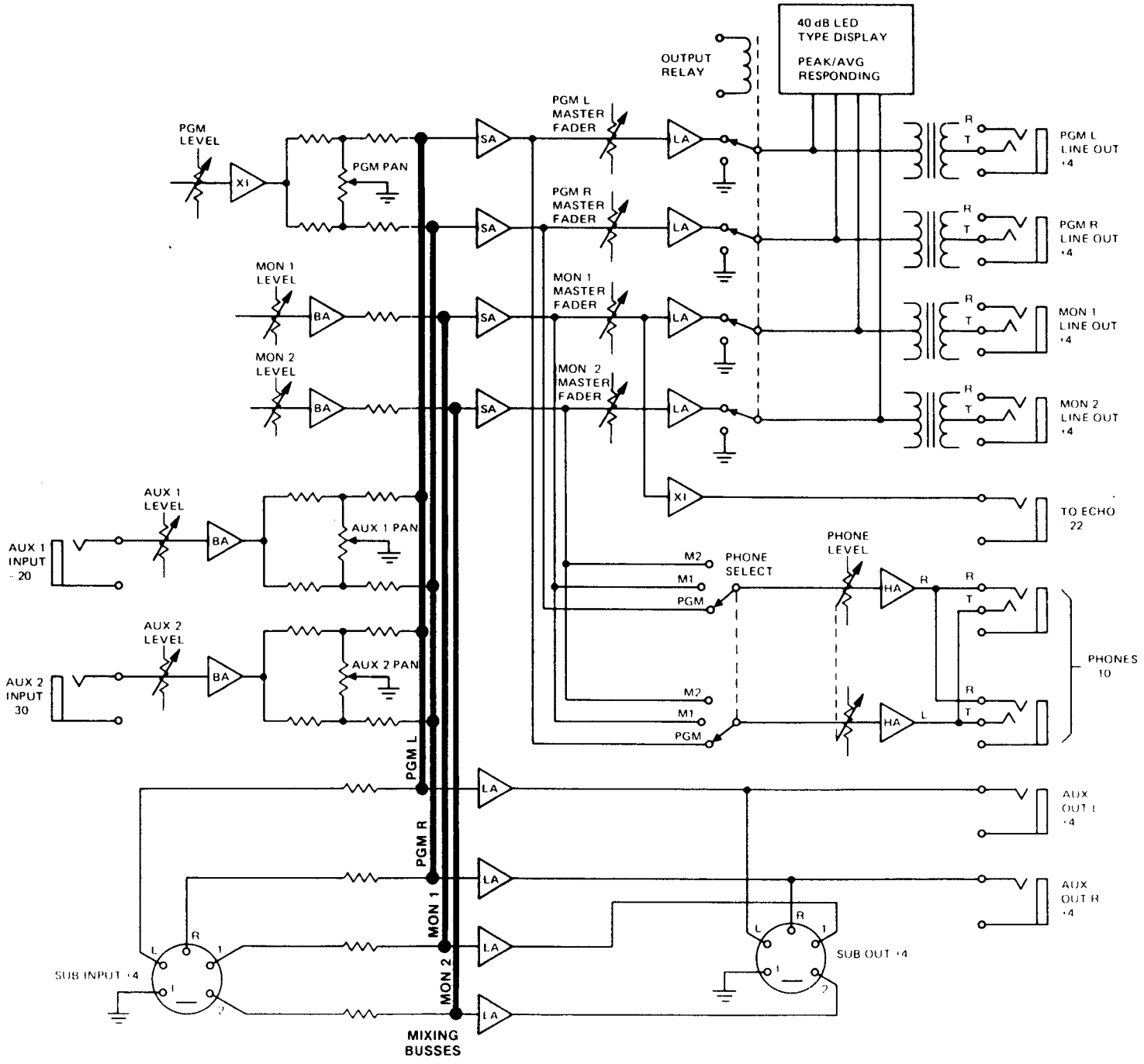


Figure 15: Program Mixing Buses

Monitor 1

Before discussing the Program output circuits, let's back up and observe the signal flow through the Input Channel Monitor 1 system. Monitor 1 receives its signal from the output of the EQ section of the Input Channel. This means that Monitor 1 is "post-EQ". Since this signal also comes after the Channel Fader, we say that Monitor 1 is "post-fader". The post-EQ/post-fader Monitor 1 signal flows through the Monitor 1 Level control, into a buffer amplifier and onto the Monitor 1 Mix Bus.

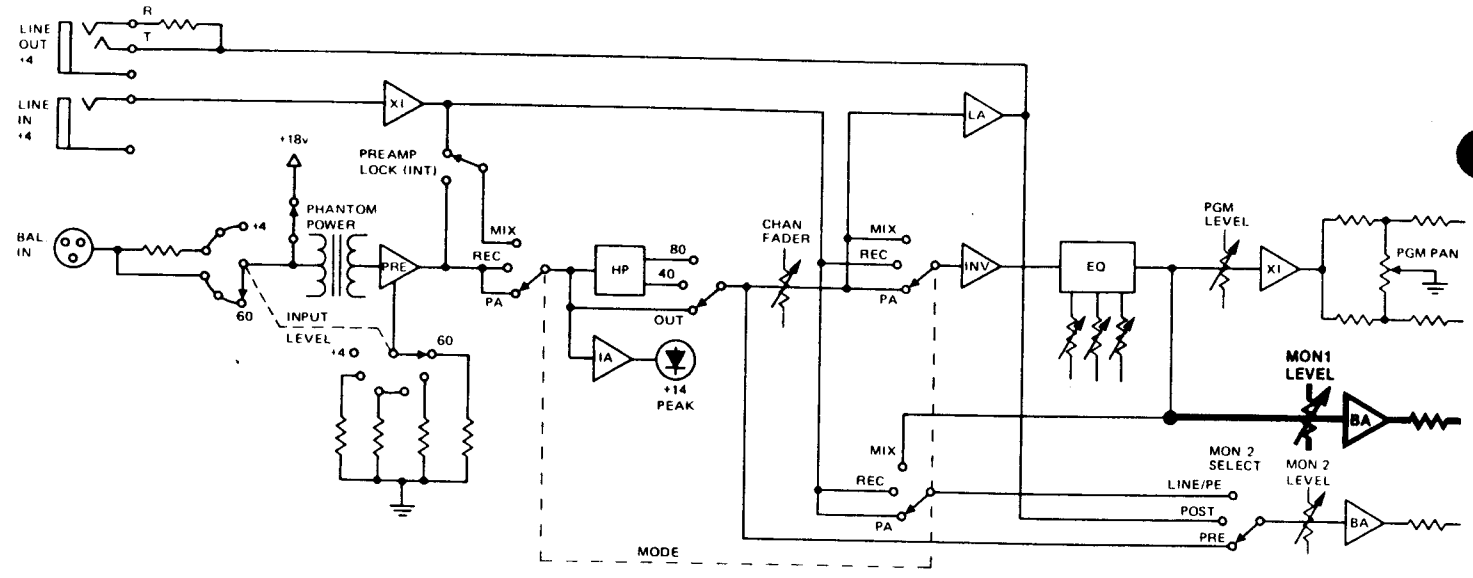


Figure 16: Input Channel Monitor 1 Circuit

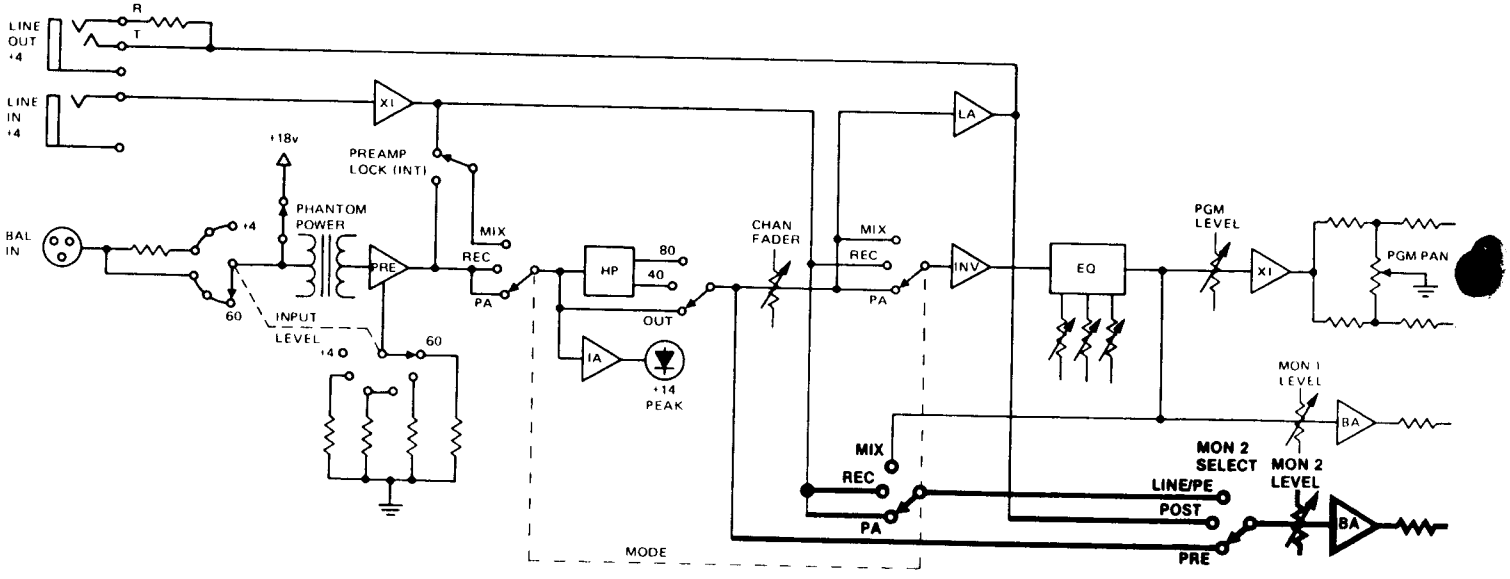


Figure 17: Input Channel Monitor 2 Circuit

Monitor 2

The Monitor 2 circuit is somewhat more complex than the Monitor 1 circuit. The Monitor 2 Select switch selects a signal and delivers it to the Monitor 2 Level control. In the "PRE" position, Monitor 2 receives its signal from the output of the Channel High Pass filter. Since this signal comes before the Channel Fader and before the Channel EQ, we call it a "pre-fader/pre-EQ" signal. In the "POST" position, Monitor 2 receives its signal from the output of the Line Amplifier which drives the Line output. This signal is post-fader/pre-EQ. In the "LINE/PE" position, Monitor 2 receives its signal from the third section of the MODE switch. If the MODE switch is in the PA or REC position, Monitor 2 receives its signal from the Line input. If the MODE switch is in the MIX position, Monitor 2 receives its signal from the same post-fader/post-EQ position as Monitor 1. Thus, Monitor 2 is a versatile mixing system that can be quite independent of the main Input Channel signal flow.

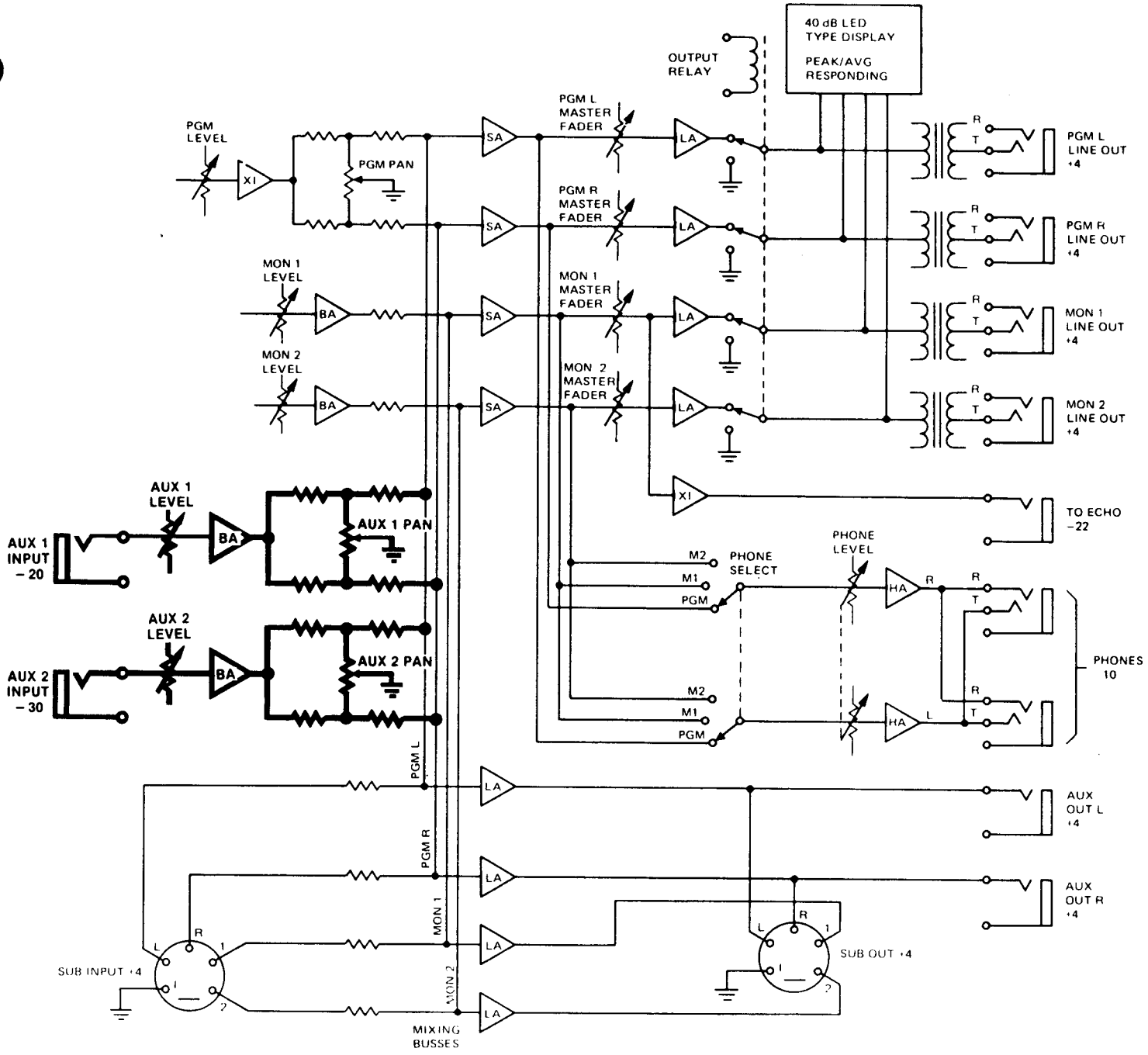


Figure 18: Aux Inputs 1 and 2

Aux Inputs 1 and 2

There are two Auxiliary inputs which are not associated with the eight Input Channels. These are standard unbalanced, high-impedance auxiliary inputs meant for low or medium level line sources. For example, a hi-fi type turntable preamplifier or tape recorder could be connected to the Auxiliary inputs. Note that the Aux 1 input is planned for a source with a nominal −20 dB (77.5 mV) output level, and the Aux 2 input is planned for a source with a nominal −30 dB (24.5 mV) output level. These different input sensitivities should help you match the Aux inputs to different sources. The two sensitivities are close enough, however, that a stereo turntable preamplifier, or other stereo device, can be connected to Aux 1 and 2 with no compatibility problems between the two inputs.

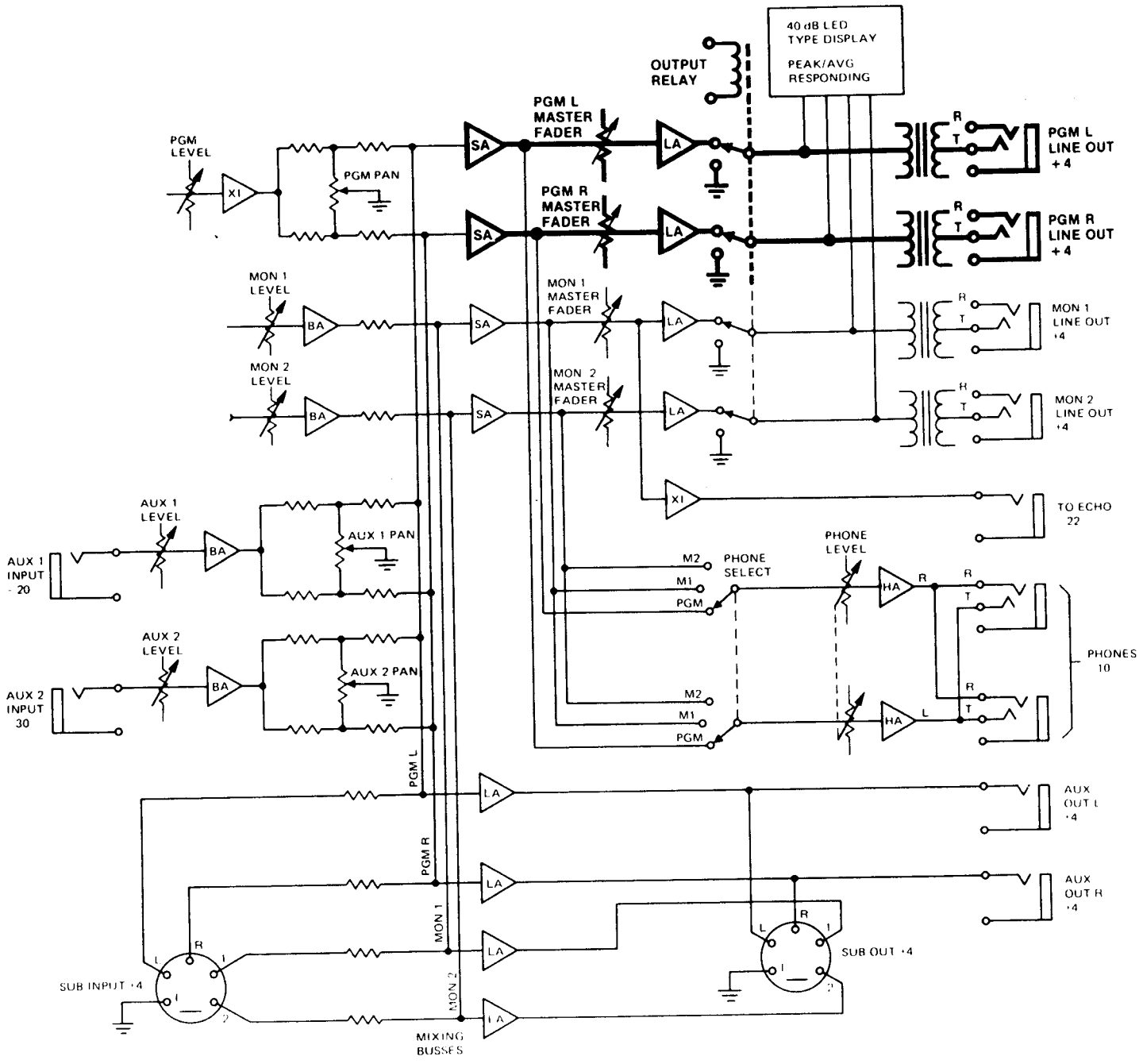


Figure 19: Program Left and Program Right Line Outputs

Program Left and Right Line Outputs

The Program Left and Program Right Line outputs are the "main" console left and right outputs. These outputs carry the mixed signals from the Program Left and Program Right Mixing Buses. The Program Left and Program Right Master Faders control these two outputs. The Program Left and Right outputs are protected against turn-on/turn-off transients by the Output Relay.

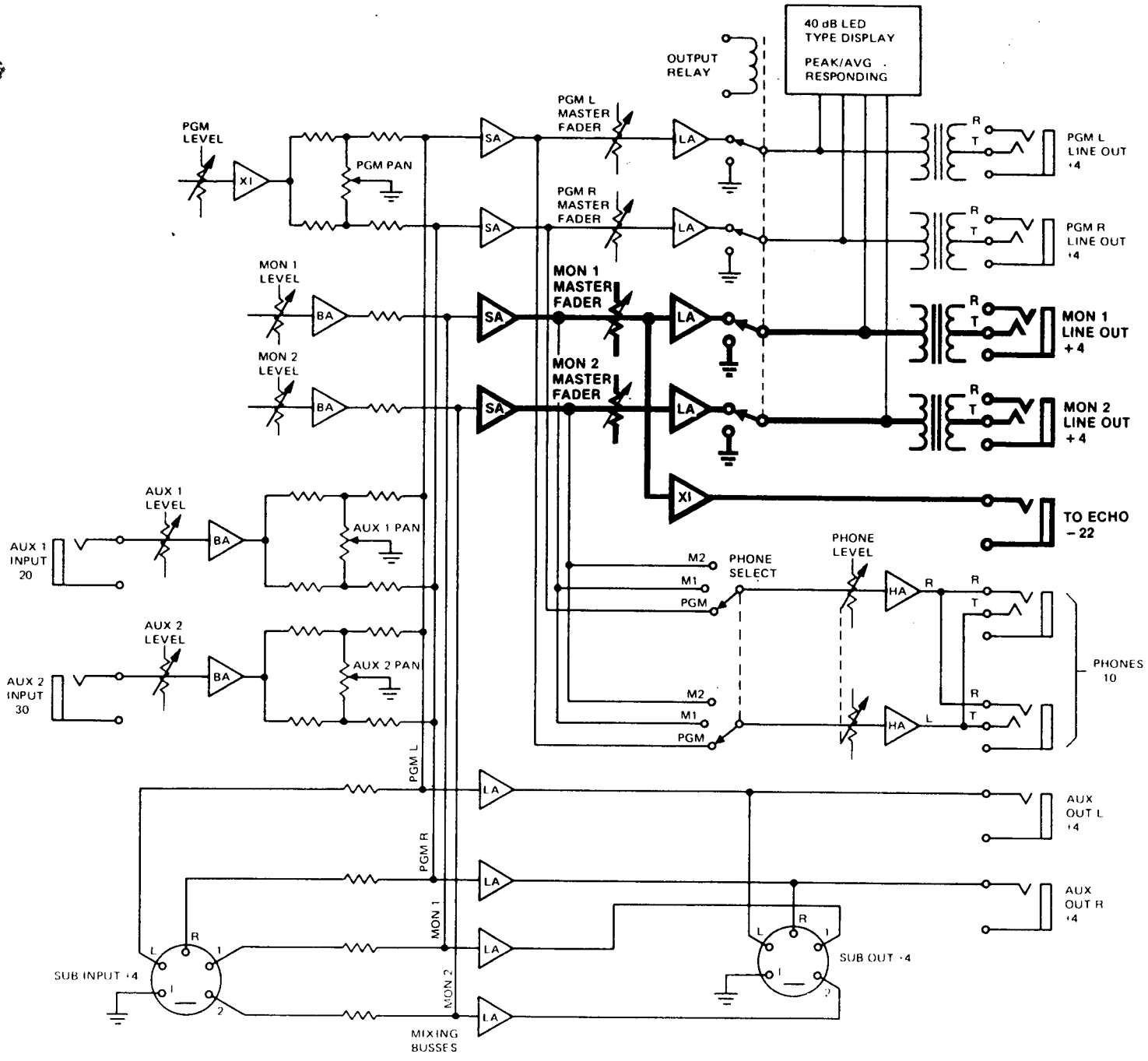


Figure 20: Monitor 1 and Monitor 2 Line Outputs and To Echo Output

Monitor Outputs and To Echo Output

The Monitor 1 and Monitor 2 outputs carry the mixed signals from the Monitor 1 and Monitor 2 Mixing Buses. The Monitor 1 and Monitor 2 Master Faders control the two Monitor outputs. The Monitor 1 and Monitor 2 outputs are protected against turn-on/turn-off transients by the Output Relay. The To Echo output carries a signal from the Monitor 1 Mixing Bus and is also controlled by the Monitor 1 Master Fader. However, the To Echo output is at a lower, −22 dB (61.6 mV), level than the Monitor 1 output. The To Echo output is planned to feed a hi-fi or musical sound type of echo unit or other low-level line device.

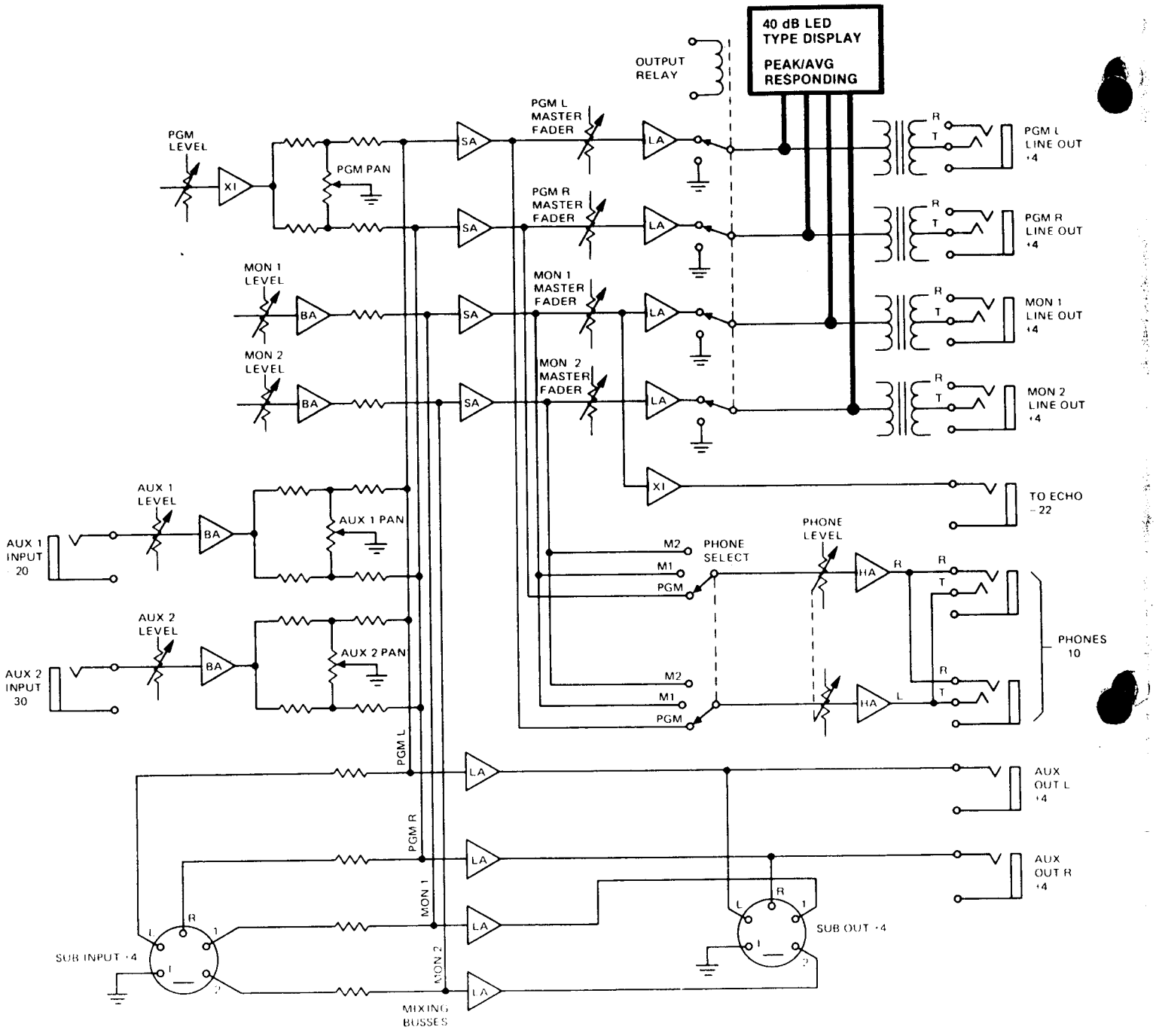


Figure 21: LED "VU" Displays

The LED "VU" Displays

The LED "VU" displays monitor the signals at the Program Left, Program Right, Monitor 1 and Monitor 2 outputs. The LED's are programmed to respond with VU-type ballistics so that their display is similar in action to a traditional VU display. Like a traditional VU meter, the display reads 0 VU when the output level is +4 dB (1.23V). The top LED in each of the four displays is a true peak indicator which lights when the output level peaks to +24 dB (12.3V). This LED is labeled "+20 VU" to corresponding to traditional "VU" labeling.

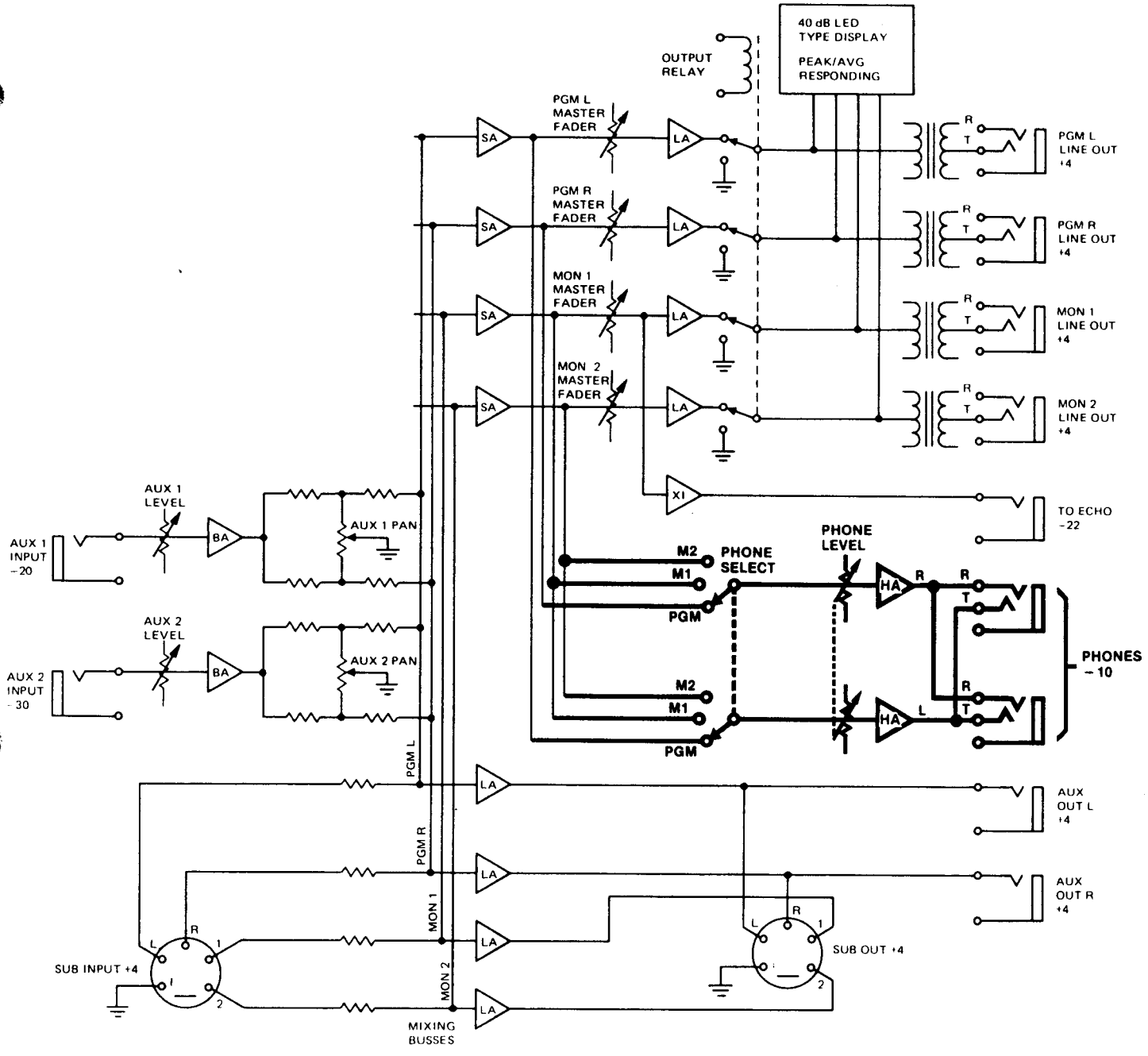


Figure 22: Headphone System

The Headphone System

There are two (stereo) Headphone outputs connected in parallel, one on the front panel, one on the rear panel. The two Headphone outputs are powered by a stereo amplifier chip capable of up to 2 watts per channel into a set of 8-ohm headphones. This means that you can connect a set of 8-ohm headphones, a pair of 8-ohm loudspeakers or up to (75) 600-ohm headphones in parallel for a headphone distribution system. The front panel Phone Level control sets the volume in the Headphone output; the Phone Select switch selects the signal appearing at the Headphone output. This signal can be the (stereo) Left and Right Program signals, the (mono) Monitor 1 signal or the (mono) Monitor 2 signal. The Headphone output receives its signal before any of the Master Faders. Thus, the Headphone output can be used for preview or cue type functions.

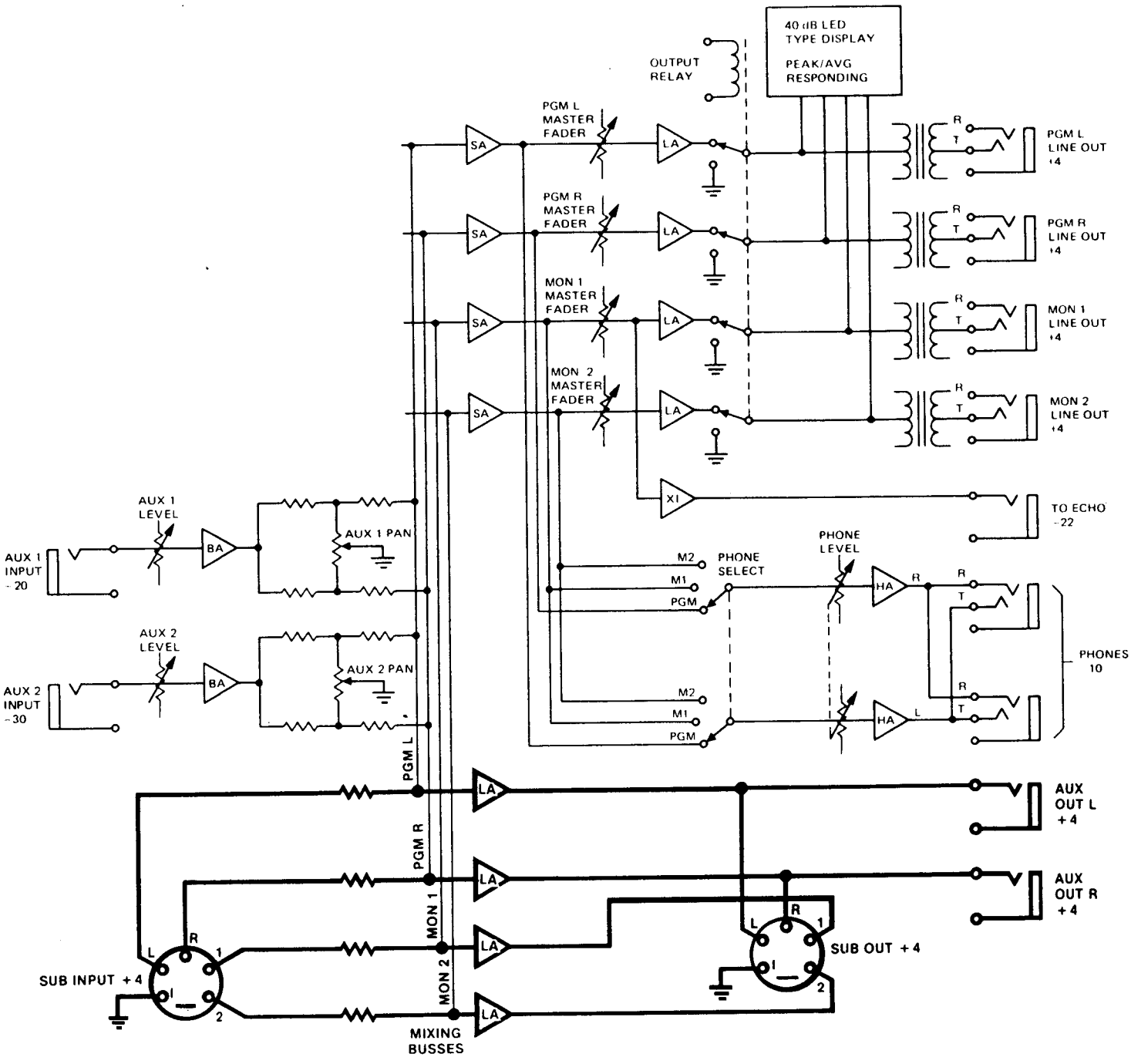


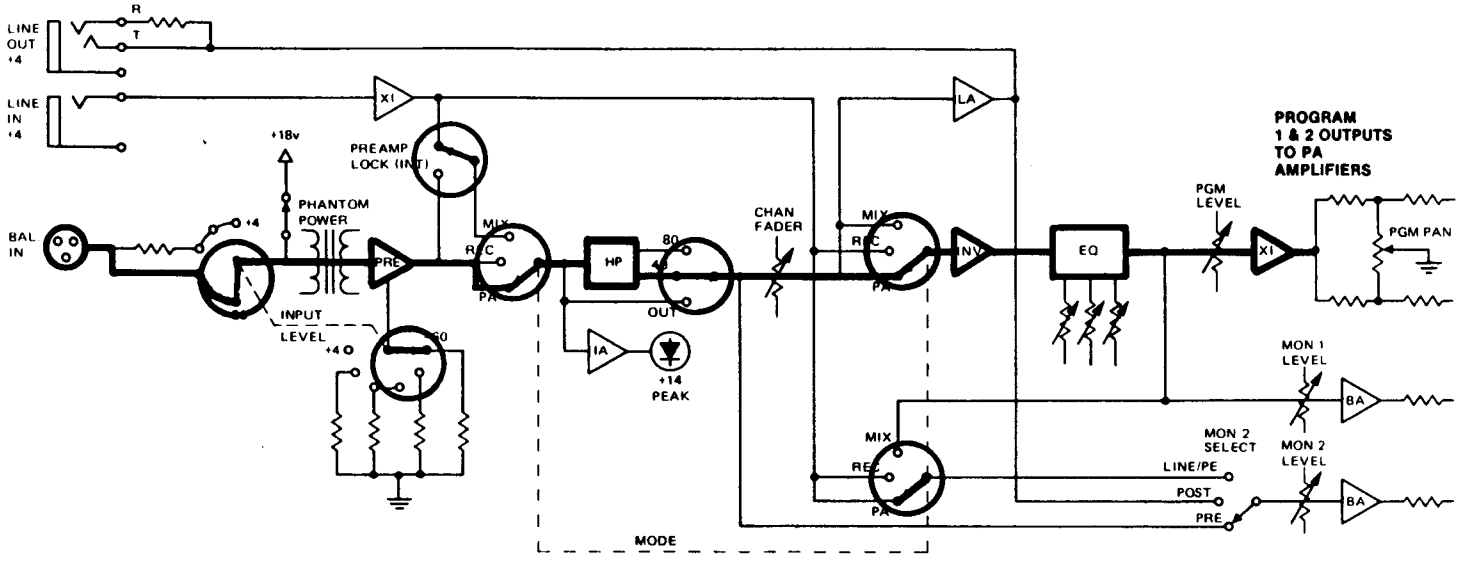
Figure 23: The Auxiliary Outputs and the Sub-In/Sub-Out Jacks

The Auxiliary Outputs and the Sub-In/Sub-Out Jacks

The Auxiliary outputs carry the signals from the Left and Right Program Mixing Buses. The signals in the Auxiliary outputs, however, are not affected by the Program Left or Right Master Faders i.e., the Auxiliary outputs are "pre-fade". The Auxiliary outputs are unbalanced, but receive their signals through a buffer amplifier. This means that the Auxiliary outputs can drive 600-ohm loads to the full +24dB (12.3V) maximum output level of the 1690.

The Sub-In/Sub-Out jacks are 5-pin "XLR-type" connectors located on the rear panel. Linking two 1690's using their Sub-In/Sub-Out jacks (as described in the 1690 Operating Instructions)

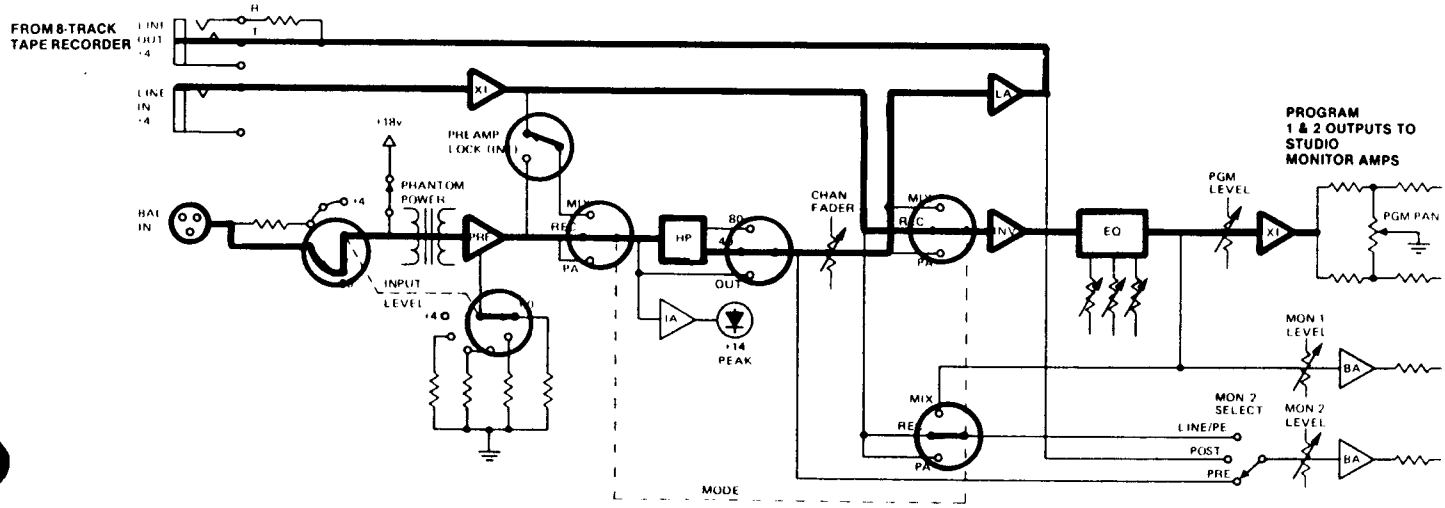
connects their Program Left and Right, Monitor 1 and Monitor 2 Mixing Buses together. This effectively creates a 16-input/2-output mixing console. Several 1690's can be linked for even more inputs. The outputs of *each* 1690 will carry the signals from *all* 16 inputs when two 1690's are linked.



SIGNAL FLOW DIAGRAM 1: THE PA MODE

Understanding the PA Mode Signal Flow

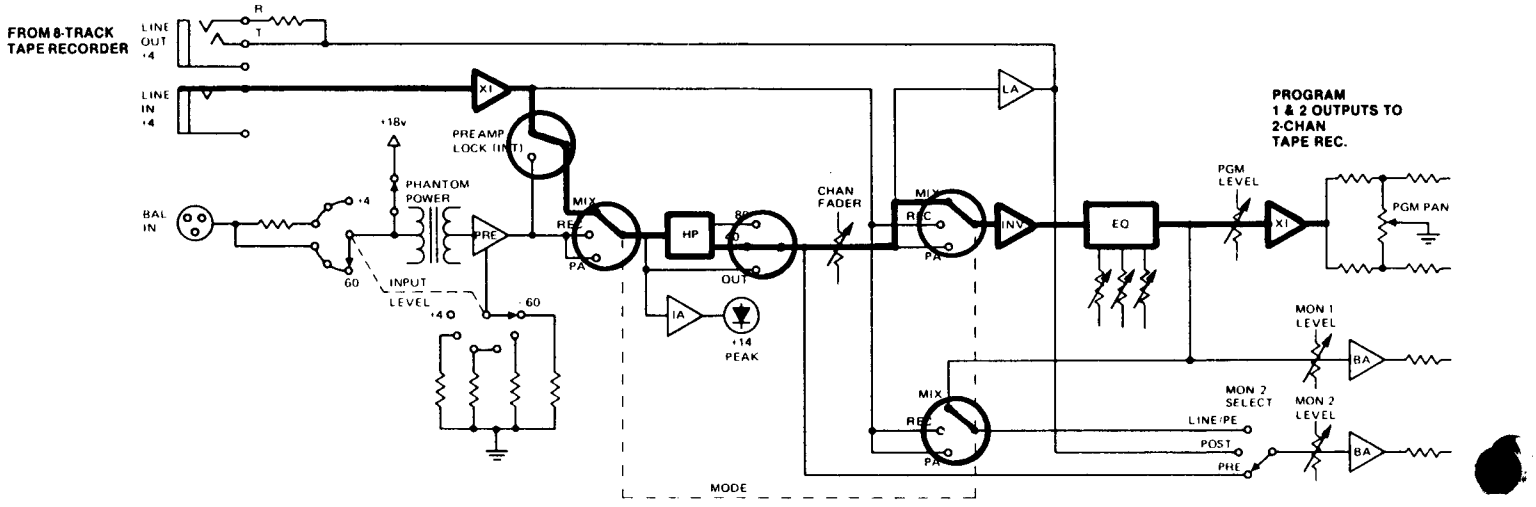
Signal Flow Diagram 1 shows the signal flow through an Input Channel which has its MODE switch in the PA position. In this mode, the 1690 is a well-designed sound reinforcement mixing console. The source, connected to the Balanced input, can be a microphone or line-level device depending on the setting of the Input Level switch. The High Pass filter should be set on the 40 or 80 Hz position. The EQ controls may be set as desired, and the Program Level control would normally be set fully clockwise. The Line output contains the post-fader/pre-EQ signal needed to feed a tape recorder input. The Input Channel signal flows onto the main Program Mix Buses, through the Master Faders and out to the rest of the sound system.



SIGNAL FLOW DIAGRAM 2: THE REC MODE

Understanding the REC Mode Signal Flow

Signal Flow Diagram 2 shows the signal flow through an Input Channel which has its MODE switch in the REC position. In this mode, the 1690 can be used as the main mixing console for an 8-track recording. The source, microphone or line-level, is connected to the Balanced input. From there, the signal flows through the Preamplifier, High Pass filter and Channel Fader, just like the PA mode. After the Channel Fader, however, the signal flows up through the Line Amplifier and through the Line output to the tape recorder's line input. The tape recorder's line output feeds the 1690's Line input. The signal flows from here to the EQ section and the Program Level control, and finally out to the Master Faders and the Program Left and Right Line outputs. The Program Left and Right Line outputs. The Program Left and Right Line outputs would probably feed studio monitor amplifiers.



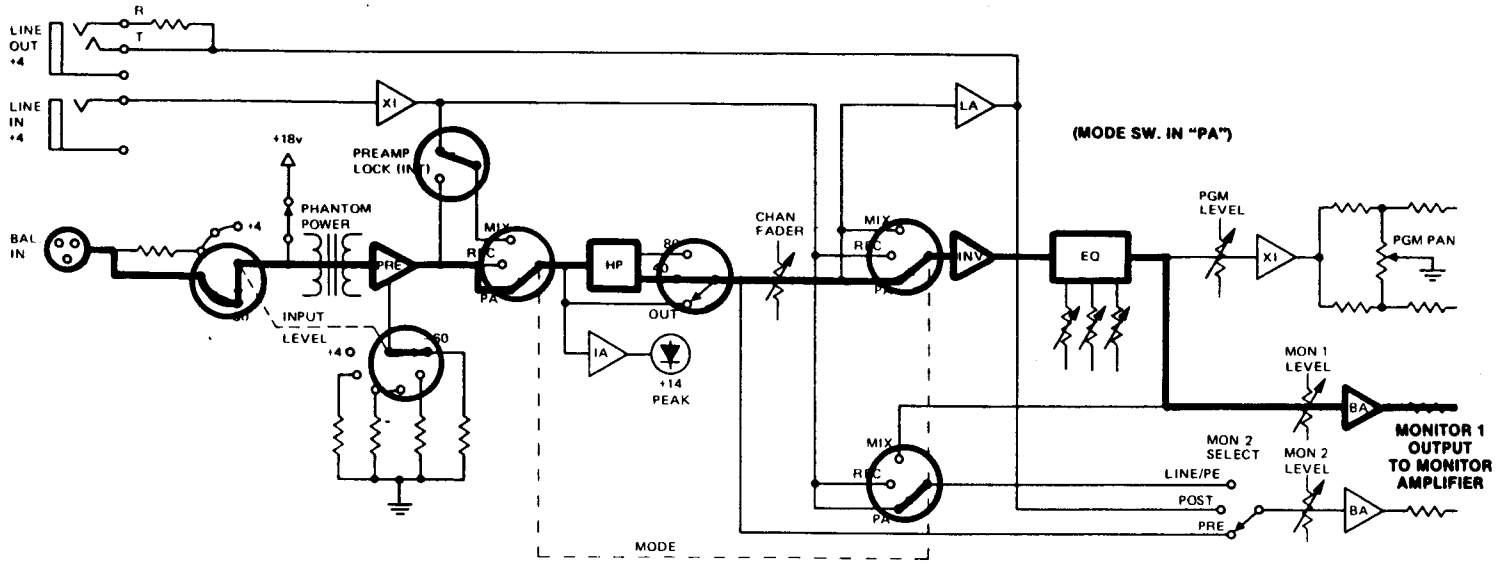
SIGNAL FLOW DIAGRAM 3: THE MIX MODE

Understanding the MIX Mode Signal Flow

The purpose of the MIX mode, as diagrammed in Signal Flow Diagram 3, is to allow you to take the 8-track recording made in the REC Mode diagram and "mix it down" onto a 2-track tape recorder. Thus, the source (the line output of the 8-track recorder) feeds the 1690's Line input. But, the MODE switch has converted the Input Channel signal flow so that the Line Input now feeds the entire Input Channel circuitry including the Channel High Pass filter, the Channel Fader and the EQ circuits. This means that you can take the 8-track recording and actually mix the eight tracks, as if they were eight microphones, onto a 2-track tape machine, adding equalization, high-pass filtering and volume control as needed on each separate track. This simple conversion is another example of the way the MODE switch increases the usefulness of the 1690.

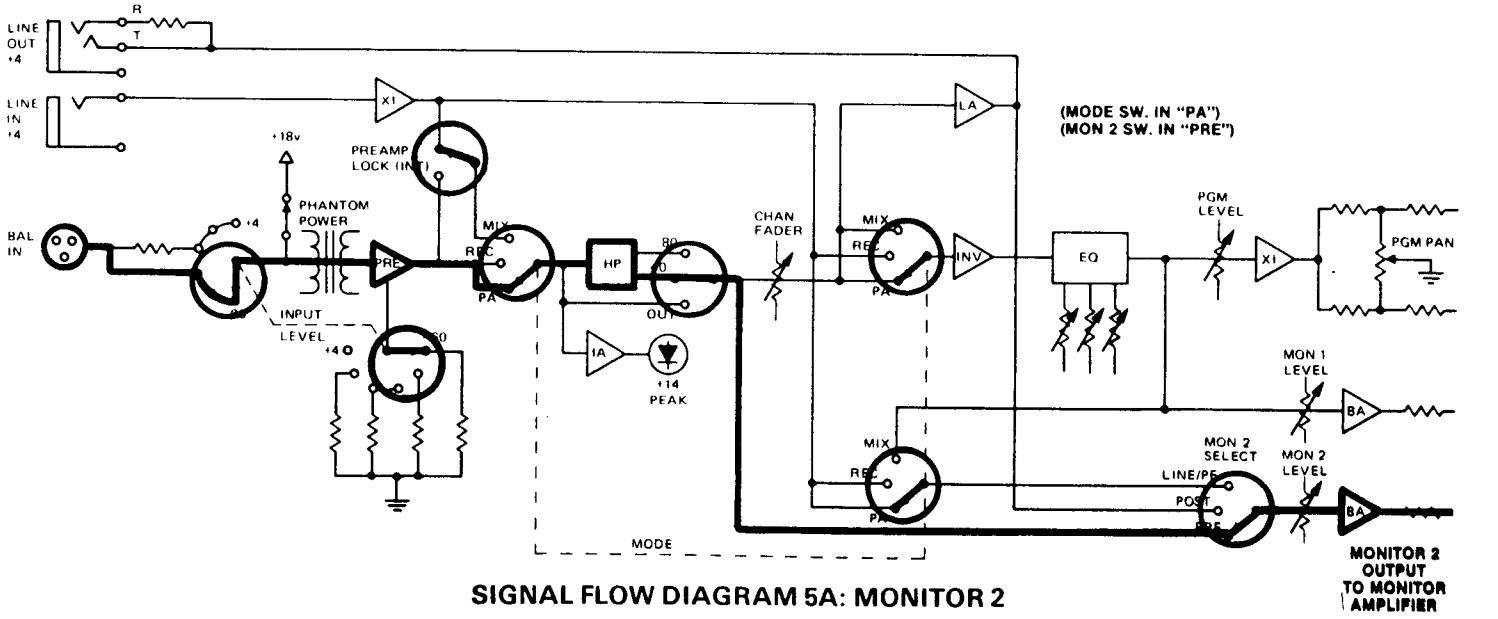
Understanding the Monitor 1 Signal Flow

Monitor 1, whose signal flow is diagrammed in Signal Flow Diagram 4, is not directly affected by the MODE switch. Monitor 1 receives its signal from the output of the Channel EQ section. However, since the Monitor 1 signal is effectively the same signal as that flowing through the entire Input Channel, Monitor 1 is indirectly affected by the MODE switch. For example, in the PA mode, Monitor 1 contains the signal which originally entered at the Balanced input. In the REC and MIX modes, Monitor 1 contains the signal which originated at the Line input. Monitor 1, as a post-fader/post-EQ monitor channel, may be used as a reinforcement (foldback) stage monitor, as monophonic studio monitor channel, or for other uses.

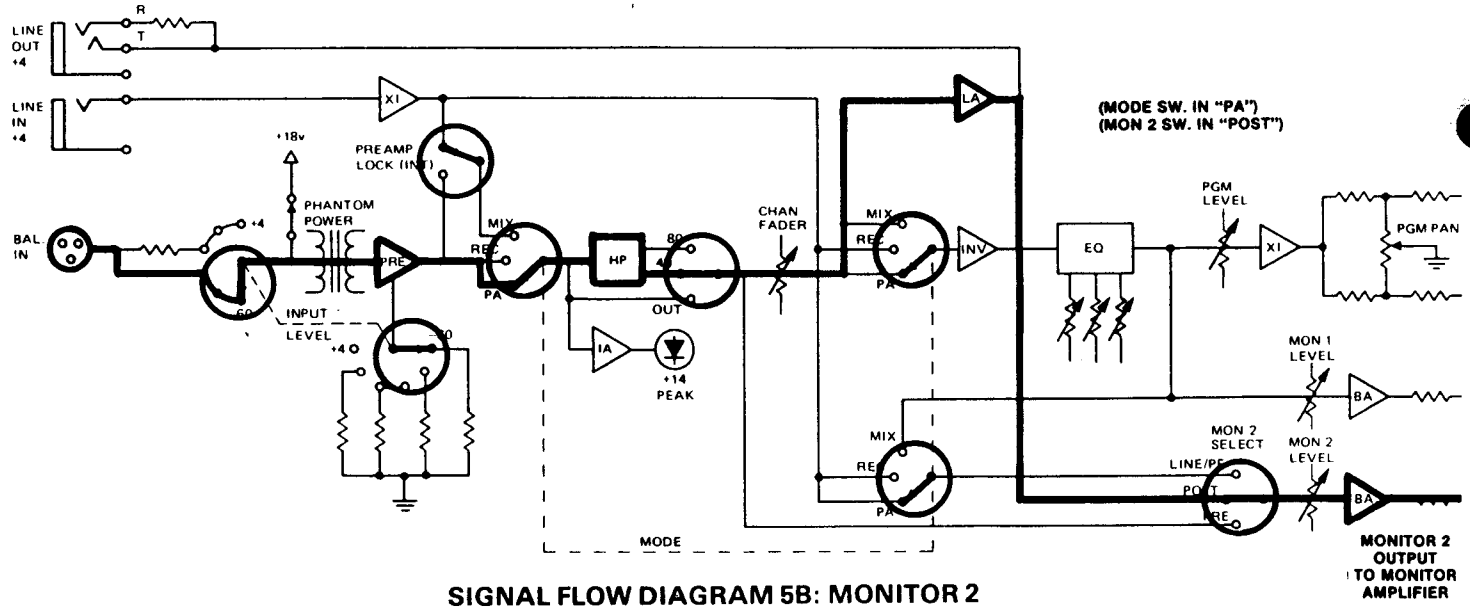


SIGNAL FLOW DIAGRAM 4: MONITOR 1

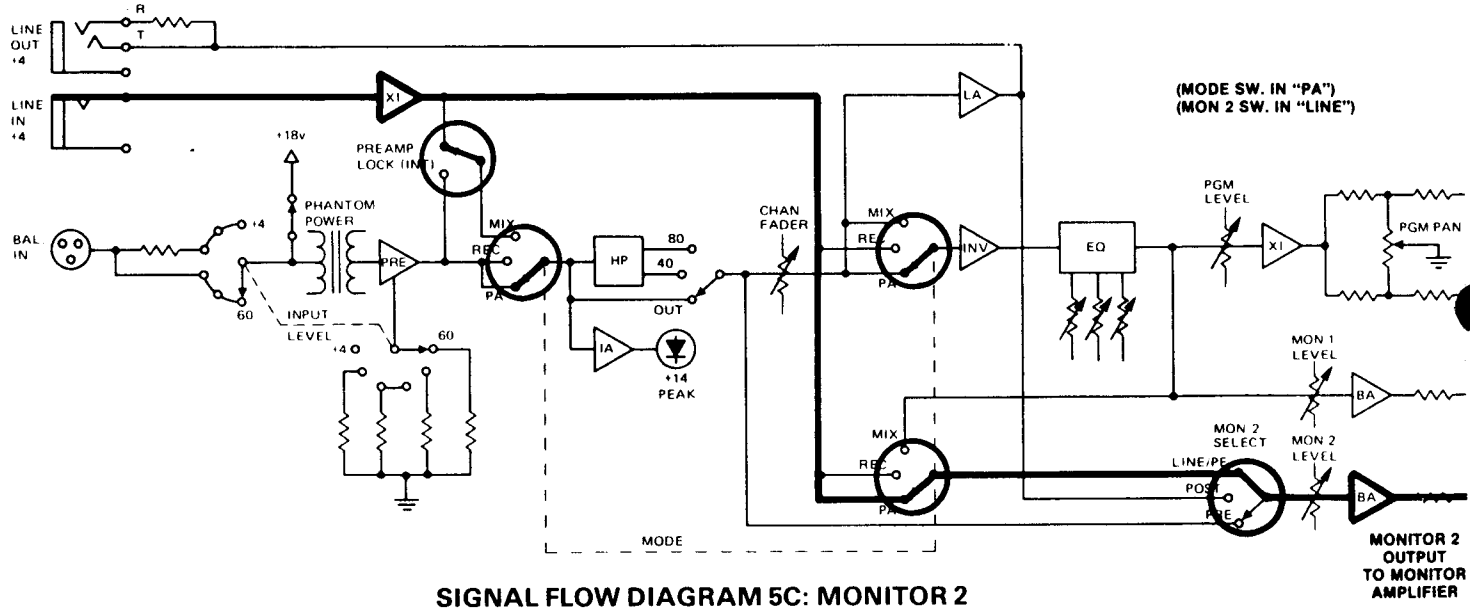
Signal Flow Diagrams 5A through 5F show signal flow for Monitor 2. If you study these diagrams, you will see that Monitor 2 can be a pre-fade/pre-EQ monitor, a post-fade/pre-EQ monitor, a post-fade/post-EQ monitor or even a separate mix channel for the eight Line inputs.



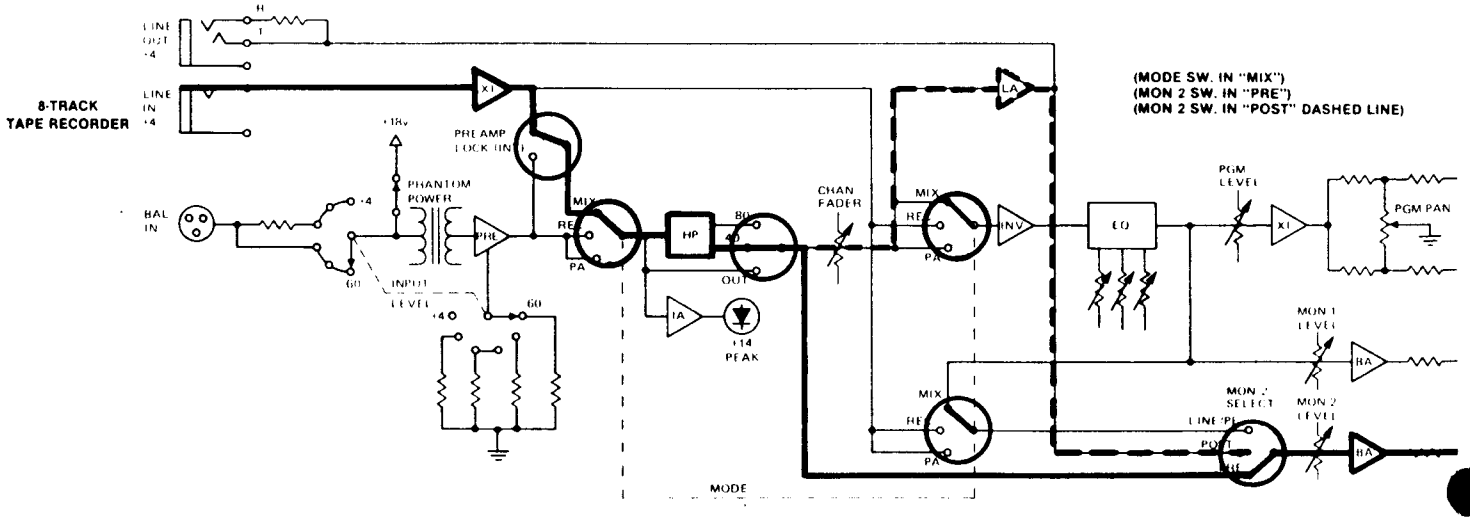
SIGNAL FLOW DIAGRAM 5A: MONITOR 2



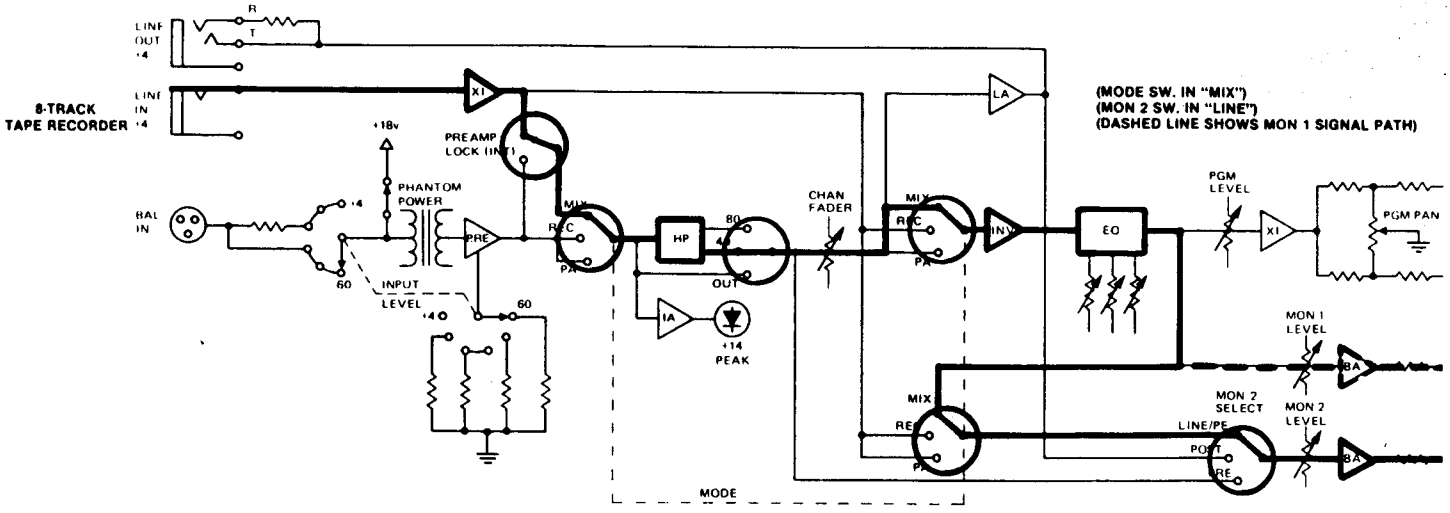
SIGNAL FLOW DIAGRAM 5B: MONITOR 2



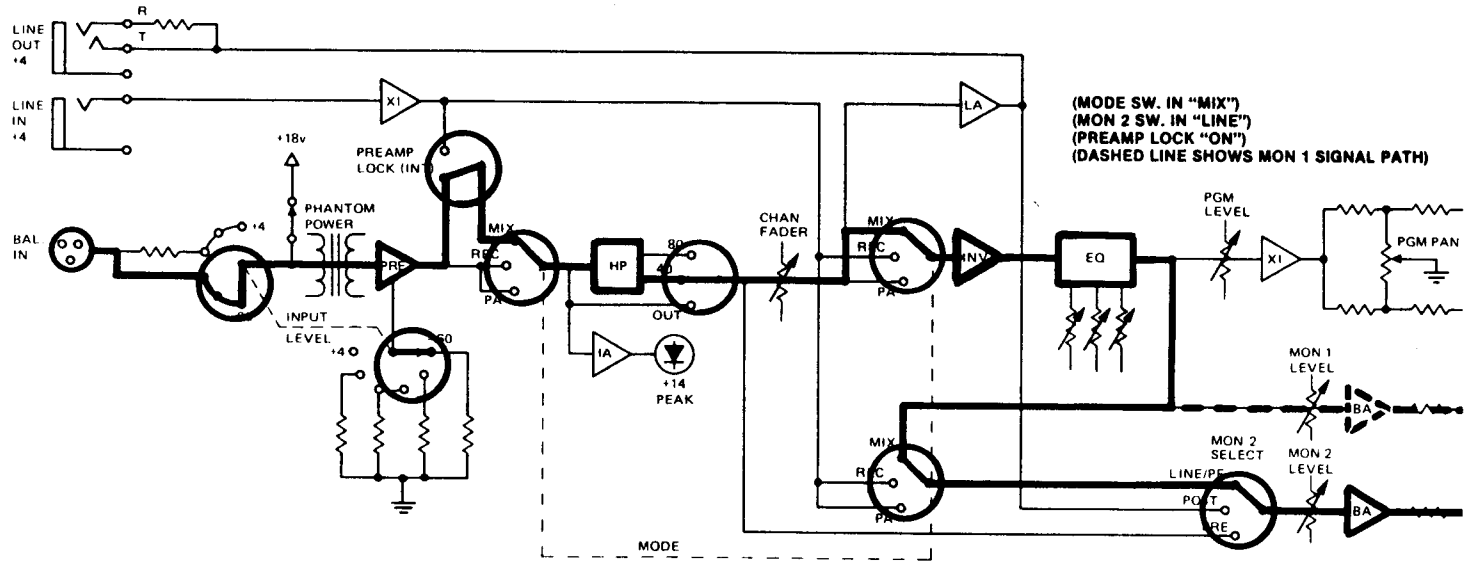
SIGNAL FLOW DIAGRAM 5C: MONITOR 2



SIGNAL FLOW DIAGRAM 5D: MONITOR 2



SIGNAL FLOW DIAGRAM 5E: MONITOR 2



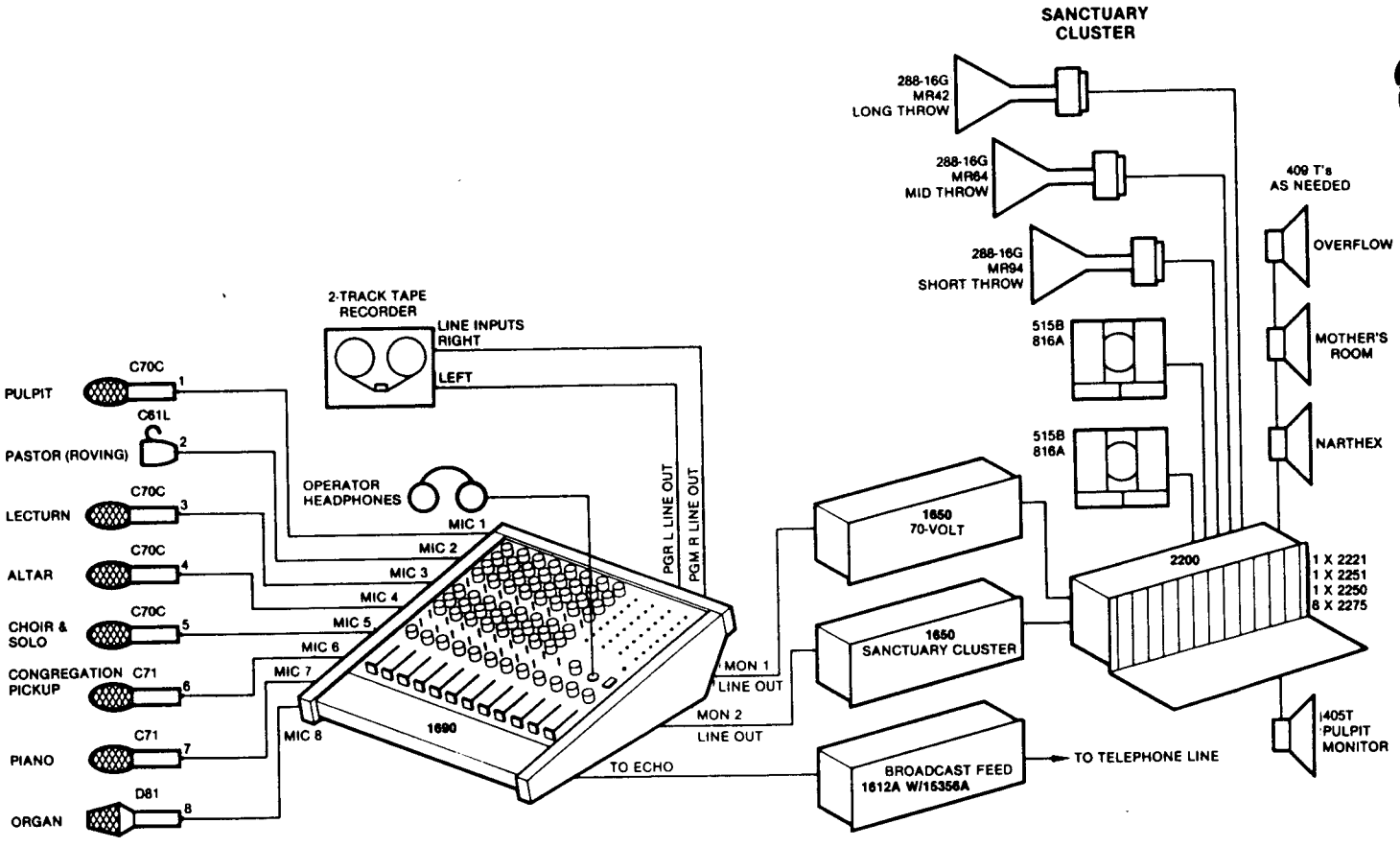
SIGNAL FLOW DIAGRAM 5F: MONITOR 2

SOME SYSTEMS USING THE 1690

For simple systems, the 1690 is much like any other small mixing console. Designing these systems with the 1690 is as straight-forward as designing with any other small mixing console. For more complex systems, the 1690 lets you do internal signal processing that would otherwise have required several external devices with complex external wiring. Thus, for these more complex systems, the 1690 may actually make the design process easier!

The following eight systems were designed to demonstrate the 1690's potential. Thus, these systems may or may not be typical of systems that you will design around the 1690. However, these systems should help acquaint you with the design process and, hopefully, give you some ideas about how to apply the 1690 in systems that you are now designing or have designed.

SYSTEM DIAGRAM 1A



System 1: The 1690 in a Church Reinforcement System with Auxiliary Functions

This is a multi-function church system. There are several microphones; more could be added with a 1599B or with another 1690 linked to the first 1690. There is a turntable input which could also be a tape input. The system includes facilities for recording a service and for transmitting the live service via telephone lines to a hospital, nursing home, radio station or other facility. There is a sanctuary cluster, a 70-volt feed for overflow areas and a pulpit monitor.

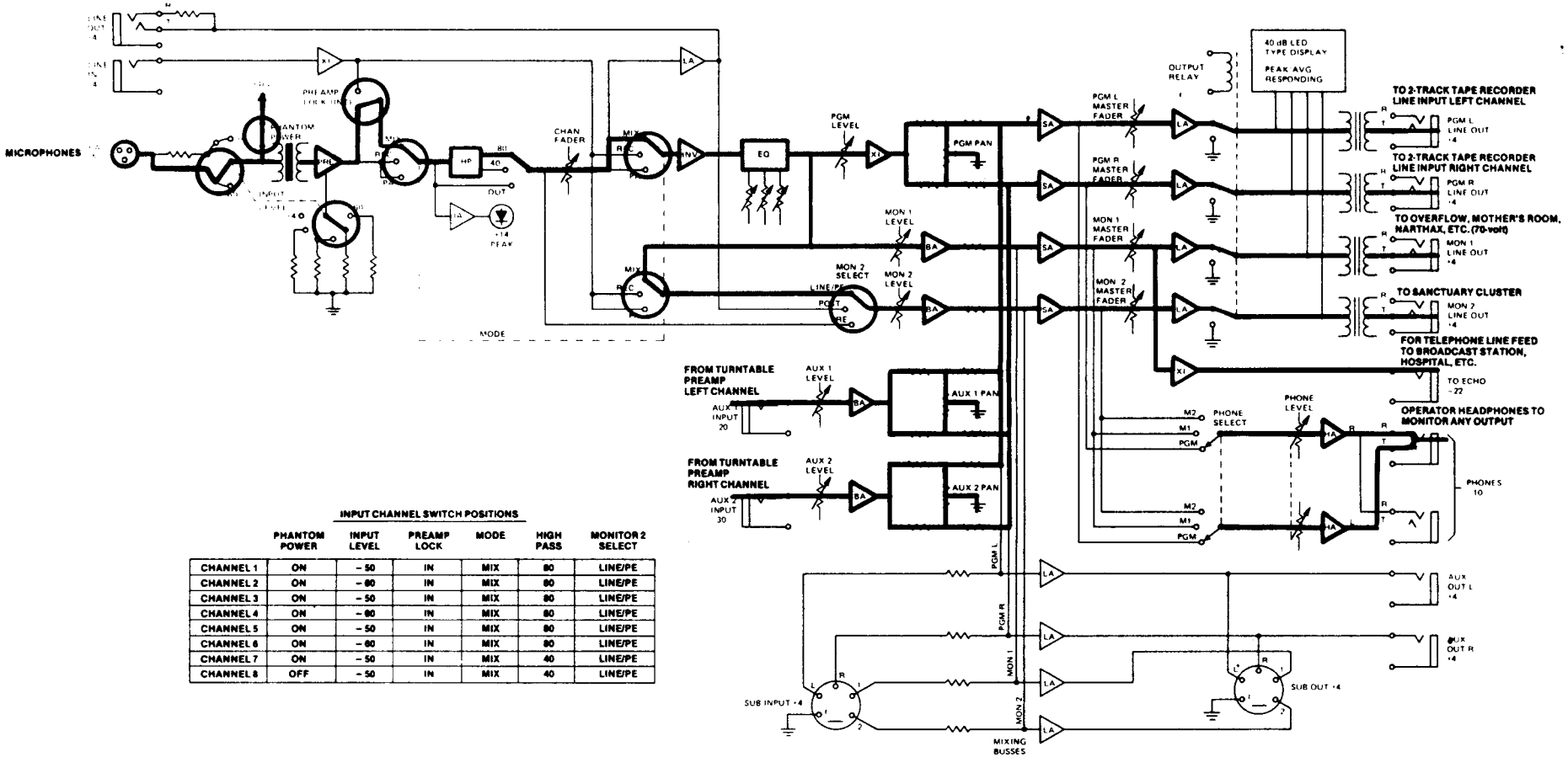
Look for the following in this system:

a) The MIX mode is used even though this is a reinforcement system. The MIX mode allows Monitor 2 to receive the same post-EQ/post-fader signal as Monitor 1. The Preamp Lock switch is IN to allow the Balanced input to be used in the MIX mode.

b) There are separate controls on each Input Channel for the tape recording, the sanctuary cluster feed and the overflow/70-volt feed. This amounts to four independent mixes on a single mixing console!

c) Since it requires approximately the same mix as the overflow/70-volt system, the telephone line signal comes from the Monitor 1 (To Echo) output.

d) The system operator can monitor any of the feeds through the Headphone output.

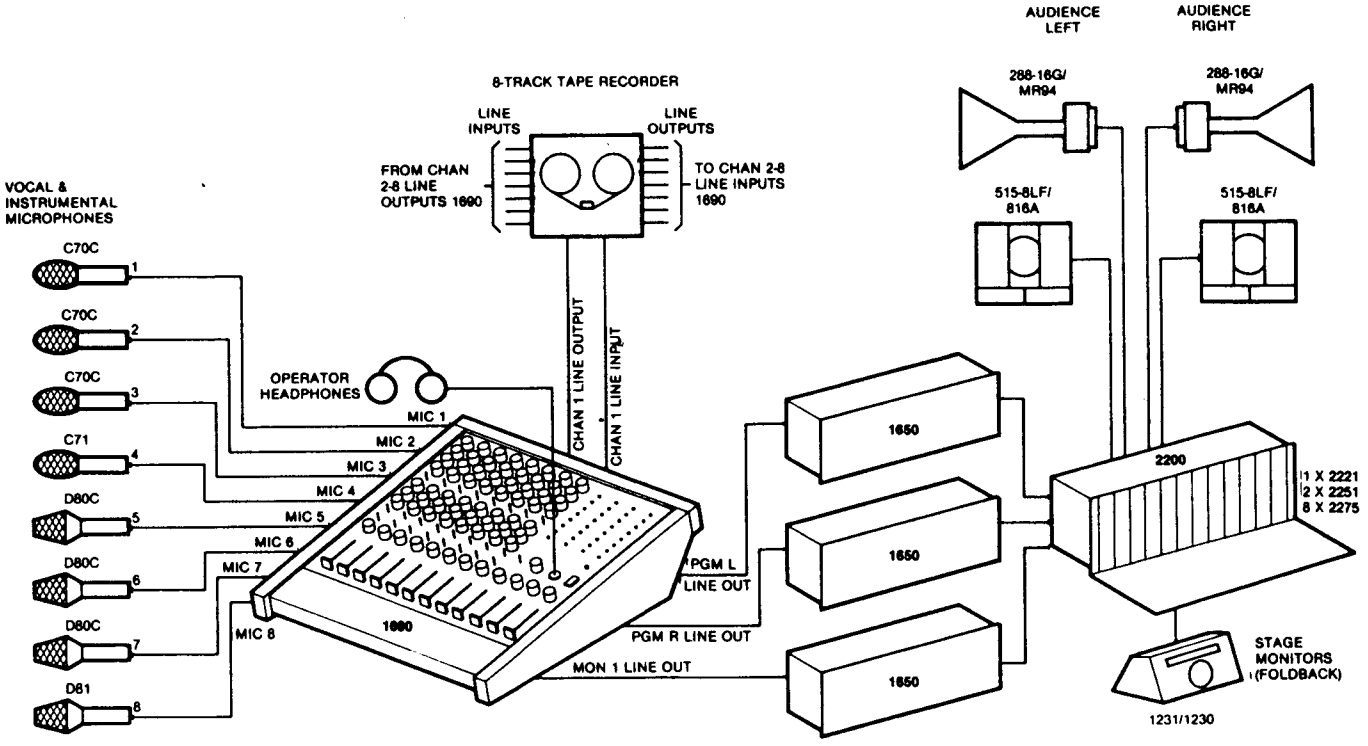


INPUT CHANNEL SWITCH POSITIONS

	PHANTOM POWER	INPUT LEVEL	PREAMP LOCK	MODE	HIGH PASS	MONITOR 2 SELECT
CHANNEL 1	ON	– 50	IN	MIX	80	LINE/PE
CHANNEL 2	ON	– 60	IN	MIX	80	LINE/PE
CHANNEL 3	ON	– 50	IN	MIX	80	LINE/PE
CHANNEL 4	ON	– 60	IN	MIX	80	LINE/PE
CHANNEL 5	ON	– 50	IN	MIX	80	LINE/PE
CHANNEL 6	ON	– 60	IN	MIX	80	LINE/PE
CHANNEL 7	ON	– 50	IN	MIX	40	LINE/PE
CHANNEL 8	OFF	– 50	IN	MIX	40	LINE/PE

System Diagram 1B: The 1690 in a Church Reinforcement System with Auxiliary Functions

SYSTEM DIAGRAM 2A



System 2: The 1690 in a Reinforcement System with Simultaneous 8-Track Recording

In System 1, the 1690 fed a two-channel, stereo tape recorder with a mix of eight microphones. In System 2, each of eight microphones feeds a separate track on an 8-track tape recorder. In addition, while the recording is taking place, an independent stereo mix of the same eight microphones feeds a two-channel sound reinforcement system — all this from the same mixing console, the 1690!

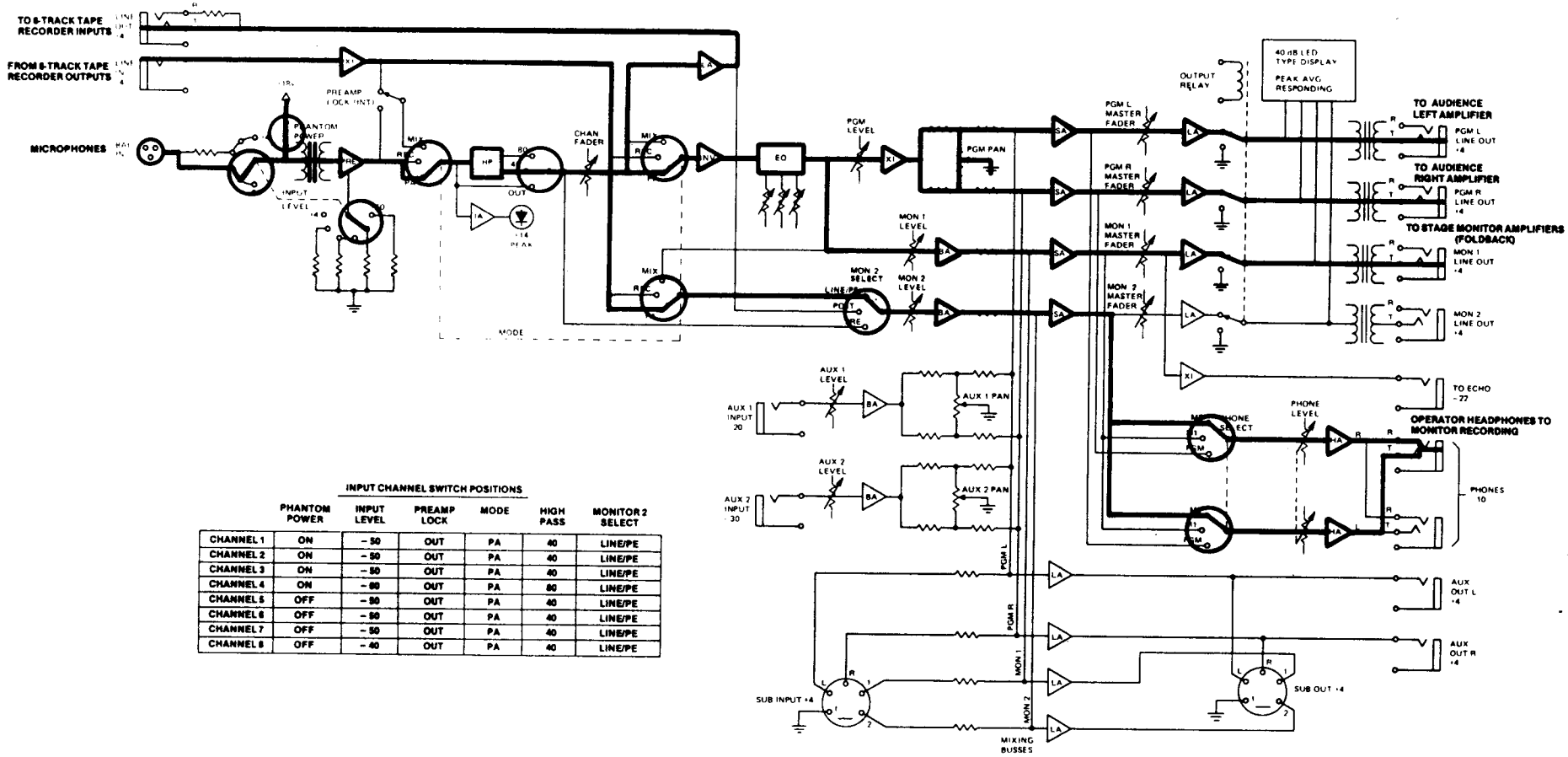
Look for these aspects of System 2:

a) The 1690 Input Channels are all in the PA mode allowing both reinforcement and recording-type functions simultaneously.

b) The Channel Faders set the levels to the tape recorder; the Program Level controls set the reinforcement system mix. Thus, changes in the reinforcement mix will not affect the recording, and, once the recording levels are set, the recording mix will not affect the reinforcement system.

c) The Input Channel EQ controls affect only the reinforcement system, not the tape recording. With the 1690, you can record with a "flat" response and add equalization during mixdown.

d) Monitor 1 feeds a stage monitor (foldback) system. Monitor 2 is reserved for the Headphone system. Using the Monitor 2 controls, the 1690 operator can do a monophonic mix of the eight tape recorder signals, or listen to each one separately, all independent of the reinforcement mix. Alternately, the 1690 operator can listen to the Monitor 1 mix or the Program Left and Right reinforcement mix.

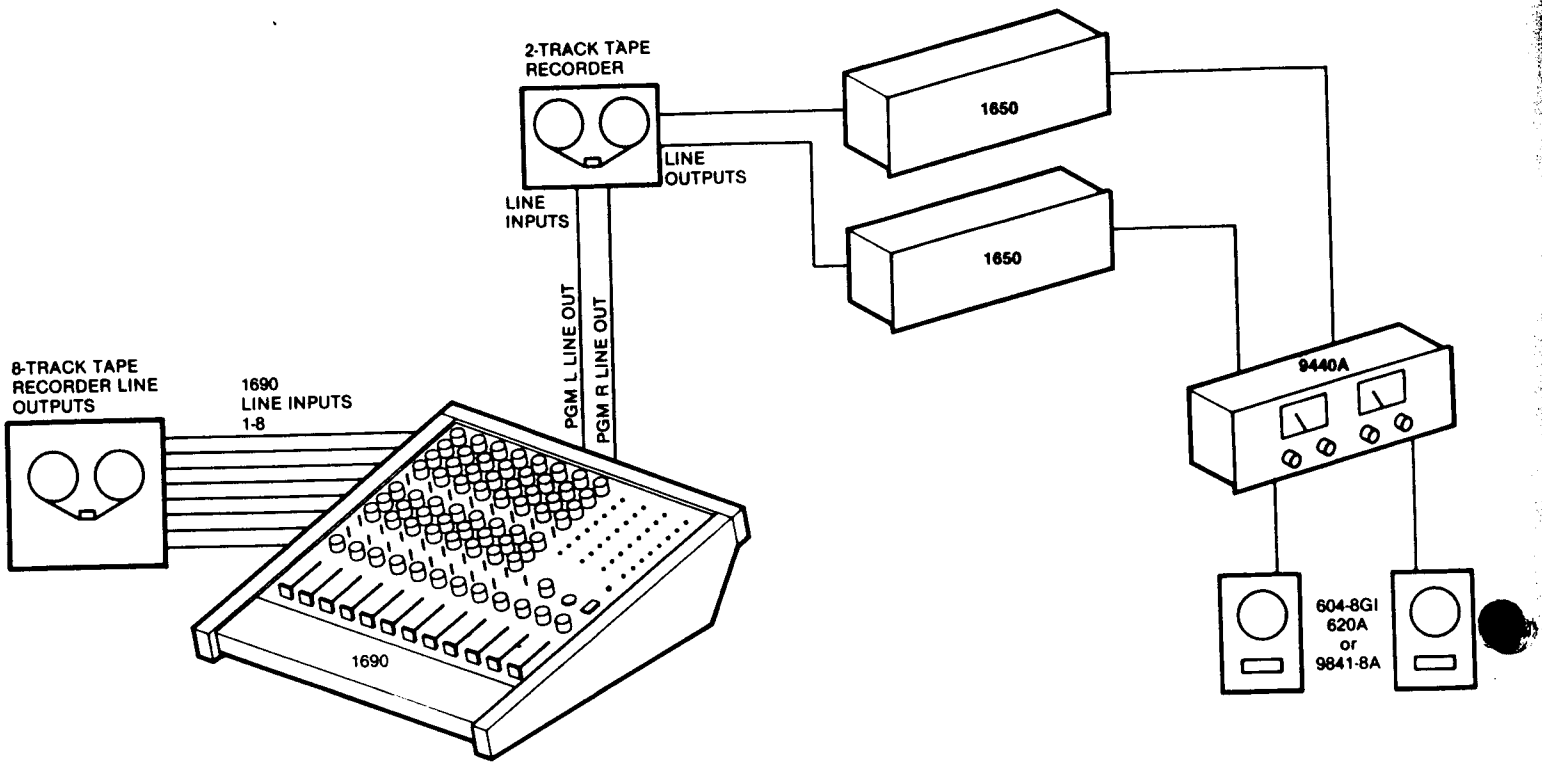


INPUT CHANNEL SWITCH POSITIONS

	PHANTOM POWER	INPUT LEVEL	PREAMP LOCK	MODE	HIGH PASS	MONITOR 2 SELECT
CHANNEL 1	ON	-50	OUT	PA	40	LINE/PE
CHANNEL 2	ON	-50	OUT	PA	40	LINE/PE
CHANNEL 3	ON	-50	OUT	PA	40	LINE/PE
CHANNEL 4	ON	-50	OUT	PA	40	LINE/PE
CHANNEL 5	OFF	-50	OUT	PA	40	LINE/PE
CHANNEL 6	OFF	-50	OUT	PA	40	LINE/PE
CHANNEL 7	OFF	-50	OUT	PA	40	LINE/PE
CHANNEL 8	OFF	-40	OUT	PA	40	LINE/PE

System Diagram 2B: The 1690 in a Reinforcement System with Simultaneous 8-Track Recording

SYSTEM DIAGRAM 3A



System 3: The 1690 in a Tape Recording Mixdown System

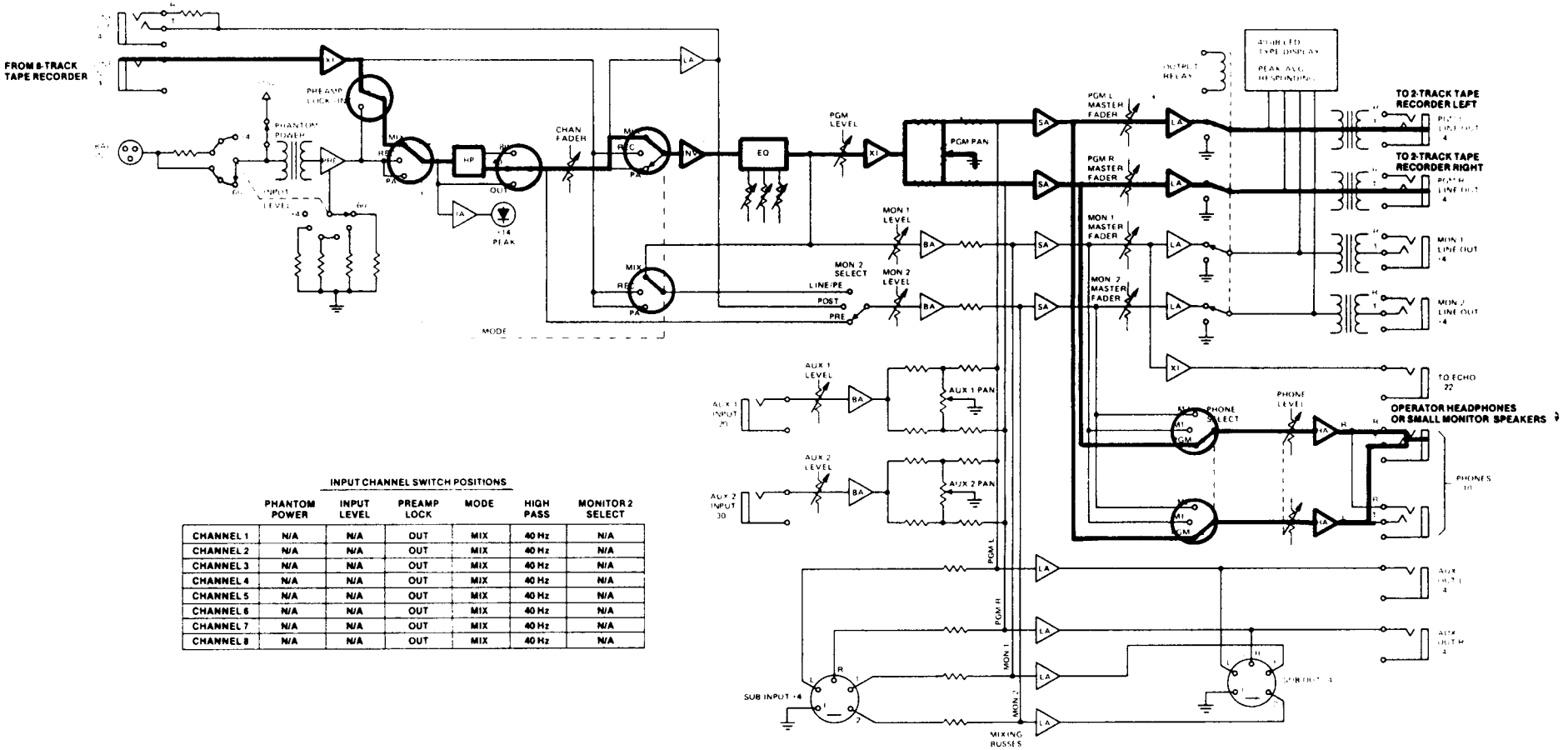
In System 2, the 1690 mixed an 8-track tape recording. For System 3, the 8-track tape recording is back in the studio where the 8 tracks must be mixed down onto a 2-track tape recorder. The 2-track, stereo tape may then be sent to a record mastering plant or it may be duplicated and used as a demo tape. During the mixdown, equalization and other effects may be added. The 1690, which was a reinforcement/recording console, now becomes a mixdown console.

Interesting aspects of this system:

a) All eight MODE switches are in the MIX position. In the MIX mode, the signal originates at the Line input instead of the Balanced input.

b) By placing the 1690 in the REC mode, the Balanced inputs could be used. This would open the Line inputs and Line outputs for effects.

c) Either way, an overall effects unit can still be connected via Monitor 1 and the To Echo output.

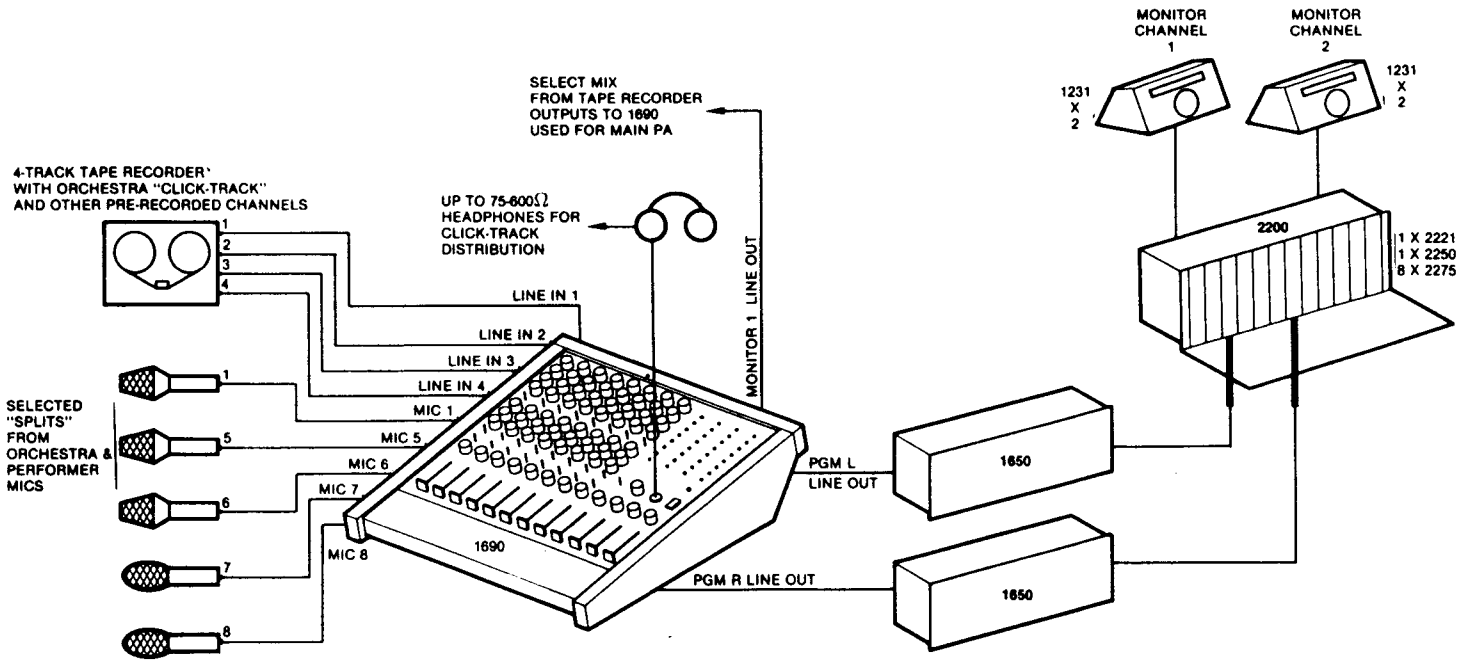


INPUT CHANNEL SWITCH POSITIONS

	PHANTOM POWER	INPUT LEVEL	PREAMP LOCK	MODE	HIGH PASS	MONITOR 2 SELECT
CHANNEL 1	N/A	N/A	OUT	MIX	40 Hz	N/A
CHANNEL 2	N/A	N/A	OUT	MIX	40 Hz	N/A
CHANNEL 3	N/A	N/A	OUT	MIX	40 Hz	N/A
CHANNEL 4	N/A	N/A	OUT	MIX	40 Hz	N/A
CHANNEL 5	N/A	N/A	OUT	MIX	40 Hz	N/A
CHANNEL 6	N/A	N/A	OUT	MIX	40 Hz	N/A
CHANNEL 7	N/A	N/A	OUT	MIX	40 Hz	N/A
CHANNEL 8	N/A	N/A	OUT	MIX	40 Hz	N/A

System Diagram 3B: The 1690 in a Tape Recording Mixdown System

SYSTEM DIAGRAM 4A



System 4: The 1690 in a Monitor System with Taped "Click-Track"

This system and System 5 show two possible monitor systems using the 1690. System 4 might be used in a live performance where pre-recorded music was played along with the live show. This often happens in a highly choreographed performance where the dancers must appear to be singing but cannot carry a microphone. In this case, the orchestra needs to hear the pre-recorded "click-track" to be able to synchronize with recorded voices. This system shows how the 1690 can do an orchestra monitor with the required click-track distributed through a headphone system.

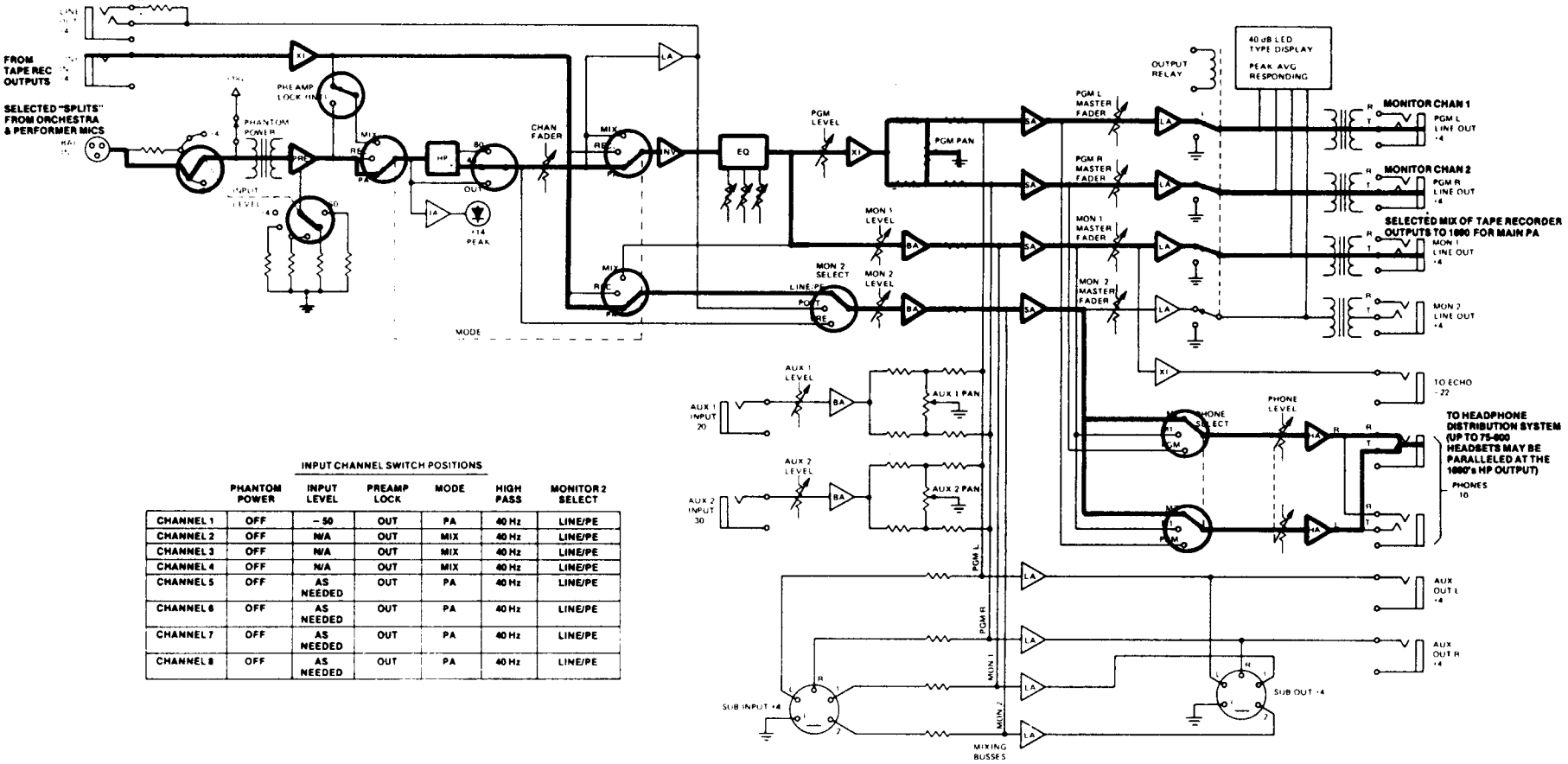
Other aspects of System 4:

a) Some Input Channels are in the MIX mode, some are in the PA mode. This allows different channels on the same 1690 to perform different functions.

b) The click-track in Channel 1 feeds only the Headphone system (through Monitor 2). This leaves the Balanced input on Channel 1 open to receive a microphone split.

c) The Monitor 1 mix is a special feed to the main reinforcement mixing console. This feed would probably contain the vocal tracks on the tape recorder for feed to the main house reinforcement system. By using the monitor 1690 to mix these tracks, the combined mix takes up only a single channel in the main mixing console.

d) Since the Headphone output will drive 8-ohm headphones, up to (75) 600-ohm headphones can be connected to the Headphone output. This would eliminate the need for a separate headphone distribution system for even a fairly large orchestra.

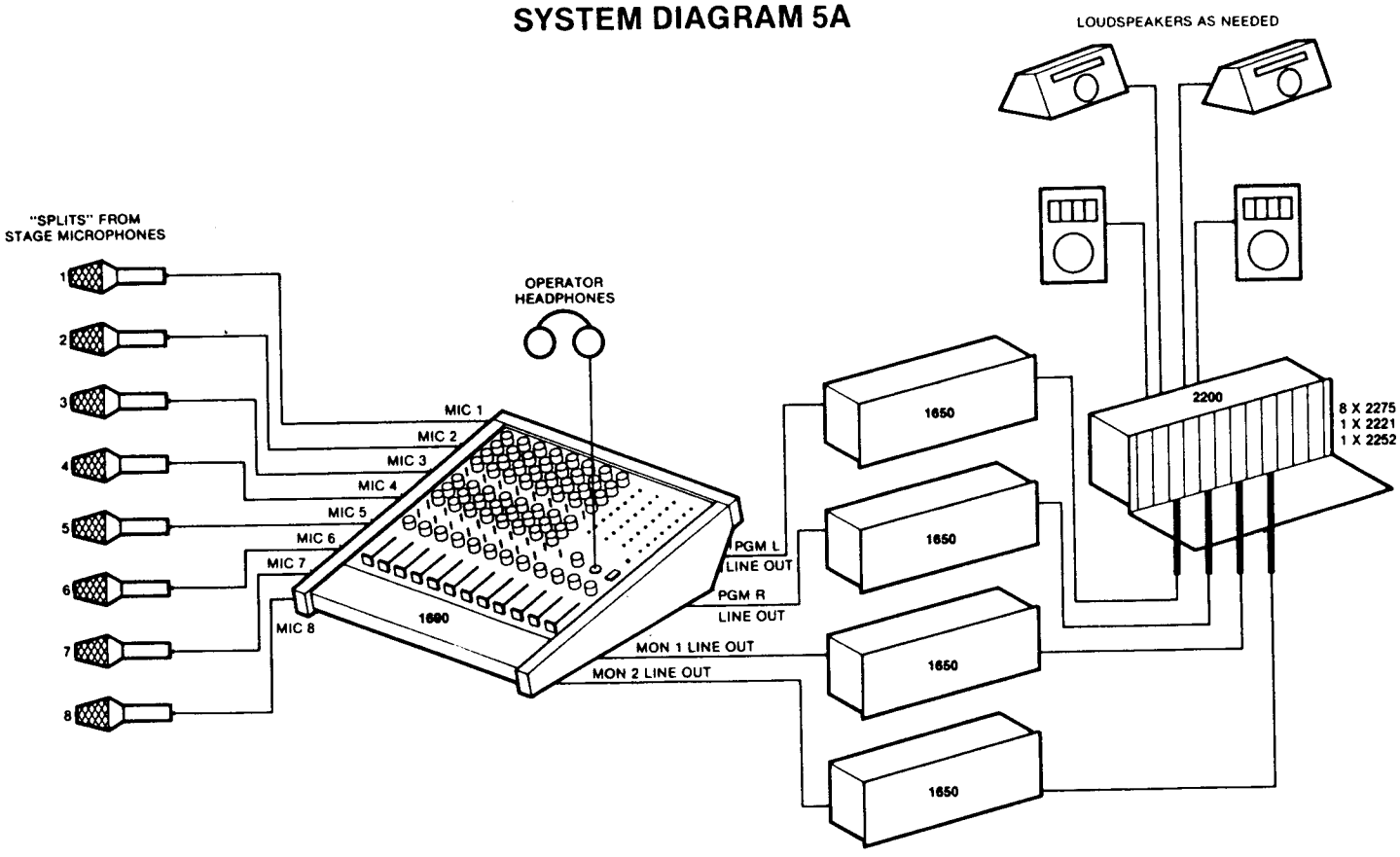


INPUT CHANNEL SWITCH POSITIONS

	PHANTOM POWER	INPUT LEVEL	PREAMP LOCK	MODE	HIGH PASS	MONITOR 2 SELECT
CHANNEL 1	OFF	– 50	OUT	PA	40 Hz	LINE/PB
CHANNEL 2	OFF	N/A	OUT	MIX	40 Hz	LINE/PB
CHANNEL 3	OFF	N/A	OUT	MIX	40 Hz	LINE/PB
CHANNEL 4	OFF	N/A	OUT	MIX	40 Hz	LINE/PB
CHANNEL 5	OFF	AS NEEDED	OUT	PA	40 Hz	LINE/PB
CHANNEL 6	OFF	AS NEEDED	OUT	PA	40 Hz	LINE/PB
CHANNEL 7	OFF	AS NEEDED	OUT	PA	40 Hz	LINE/PB
CHANNEL 8	OFF	AS NEEDED	OUT	PA	40 Hz	LINE/PB

System Diagram 4B: The 1690 in a Monitor System with Taped "Click-Track"

SYSTEM DIAGRAM 5A



System 5: 8-Input, 4-Mix Monitor System Using the 1690

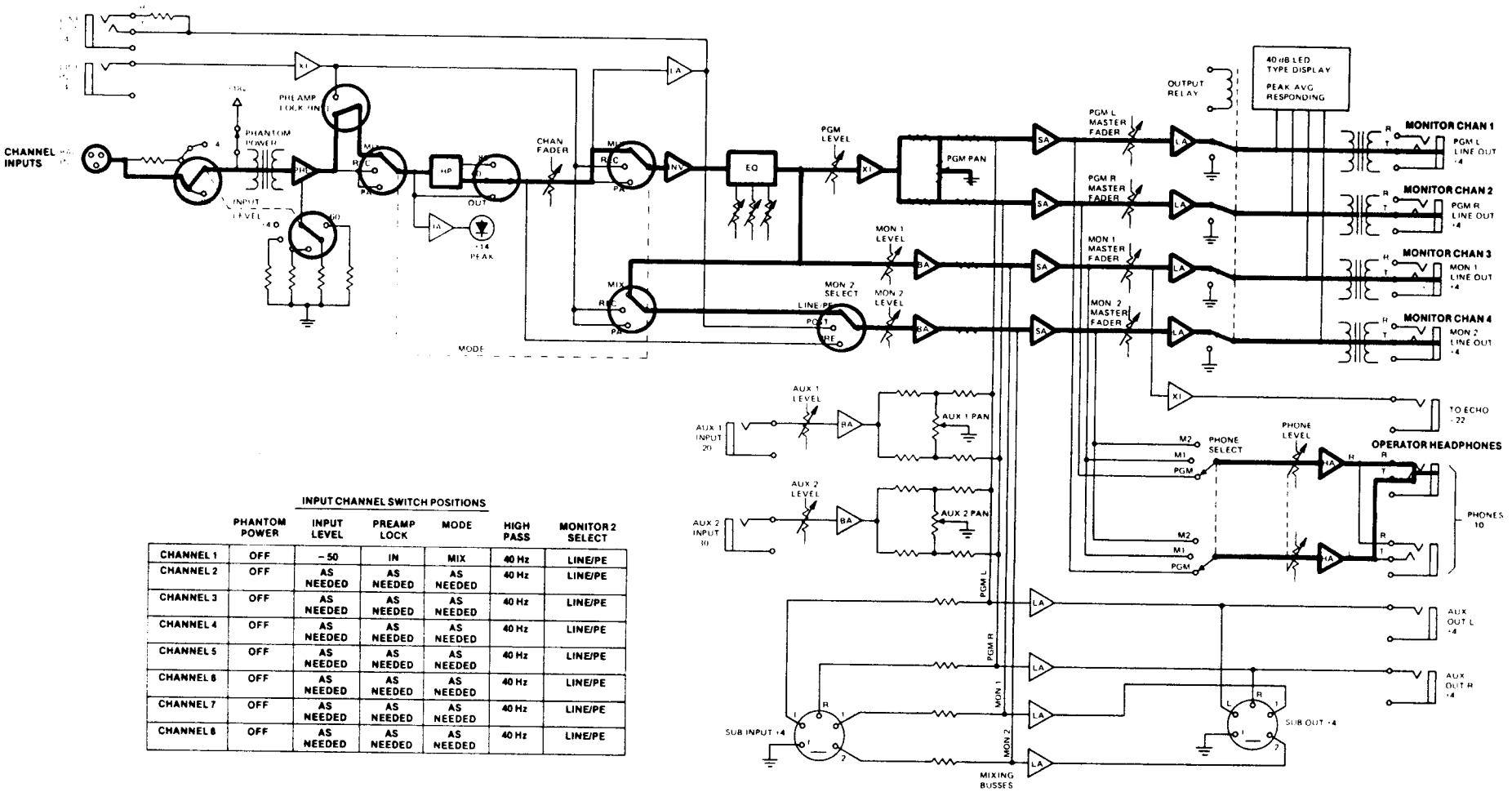
Stage monitors for a live performance usually require several different mixes. A lead vocalist may want to hear lead vocal, backup vocals and a low-level mix of rhythm instruments. A drummer may want primarily instruments with some vocals. If they could have it, each performer would probably request a different mix in their individual monitors. The 1690 can provide up to four totally independent mixes from eight separate sources. With two 1690's linked together, up to sixteen different sources can be mixed to the four outputs. In the link configuration there are two outputs for each of the four separate mixes. If that sounds confusing, keep in mind that for someone who often mixes stage monitors, this type of setup is not at all uncommon. Keep in mind, too, that the 1690 performs this function with no special modifications, and no external accessories.

Examine these aspects of System 5:

a) The MIX mode (with Preamp Lock IN) allows Monitor 2 to receive the same signal as Monitor 1. Thus, two of the mixes are controlled by the Program Level control and the Program Pan control. The other two mixes are controlled by the Monitor 1 and 2 controls. The EQ controls affect all four mixes, and the Channel Fader acts like a "channel master" control for the four mixes.

b) Monitor 2 can be a "pre-fade/pre-EQ" mix by using the PRE setting on the Monitor 2 Select switch.

c) In the PA mode, Monitor 2 can mix an entirely separate set of eight Line inputs (use the LINE/PE setting on the Monitor 2 Select switch). This means that a single 1690 actually mixes 16 separate inputs.

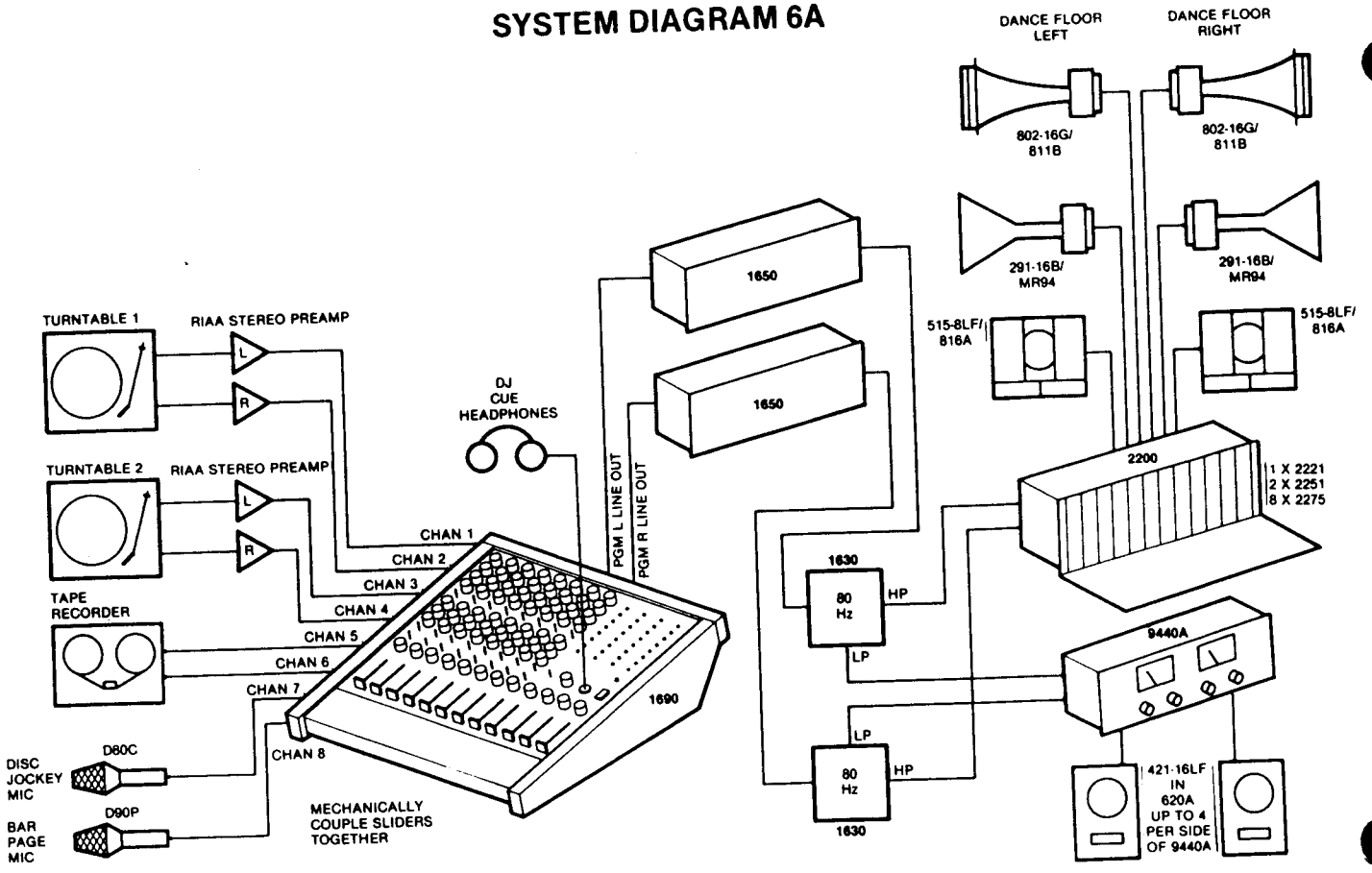


INPUT CHANNEL SWITCH POSITIONS

	PHANTOM POWER	INPUT LEVEL	PREAMP LOCK	MODE	HIGH PASS	MONITOR 2 SELECT
CHANNEL 1	OFF	-50	IN	MIX	40 Hz	LINE/PE
CHANNEL 2	OFF	AS NEEDED	AS NEEDED	AS NEEDED	40 Hz	LINE/PE
CHANNEL 3	OFF	AS NEEDED	AS NEEDED	AS NEEDED	40 Hz	LINE/PE
CHANNEL 4	OFF	AS NEEDED	AS NEEDED	AS NEEDED	40 Hz	LINE/PE
CHANNEL 5	OFF	AS NEEDED	AS NEEDED	AS NEEDED	40 Hz	LINE/PE
CHANNEL 6	OFF	AS NEEDED	AS NEEDED	AS NEEDED	40 Hz	LINE/PE
CHANNEL 7	OFF	AS NEEDED	AS NEEDED	AS NEEDED	40 Hz	LINE/PE
CHANNEL 8	OFF	AS NEEDED	AS NEEDED	AS NEEDED	40 Hz	LINE/PE

System Diagram 5B: 8-Input, 4-Mix Monitor System Using the 1690

SYSTEM DIAGRAM 6A



System 6: A Discotheque System Using the 1690

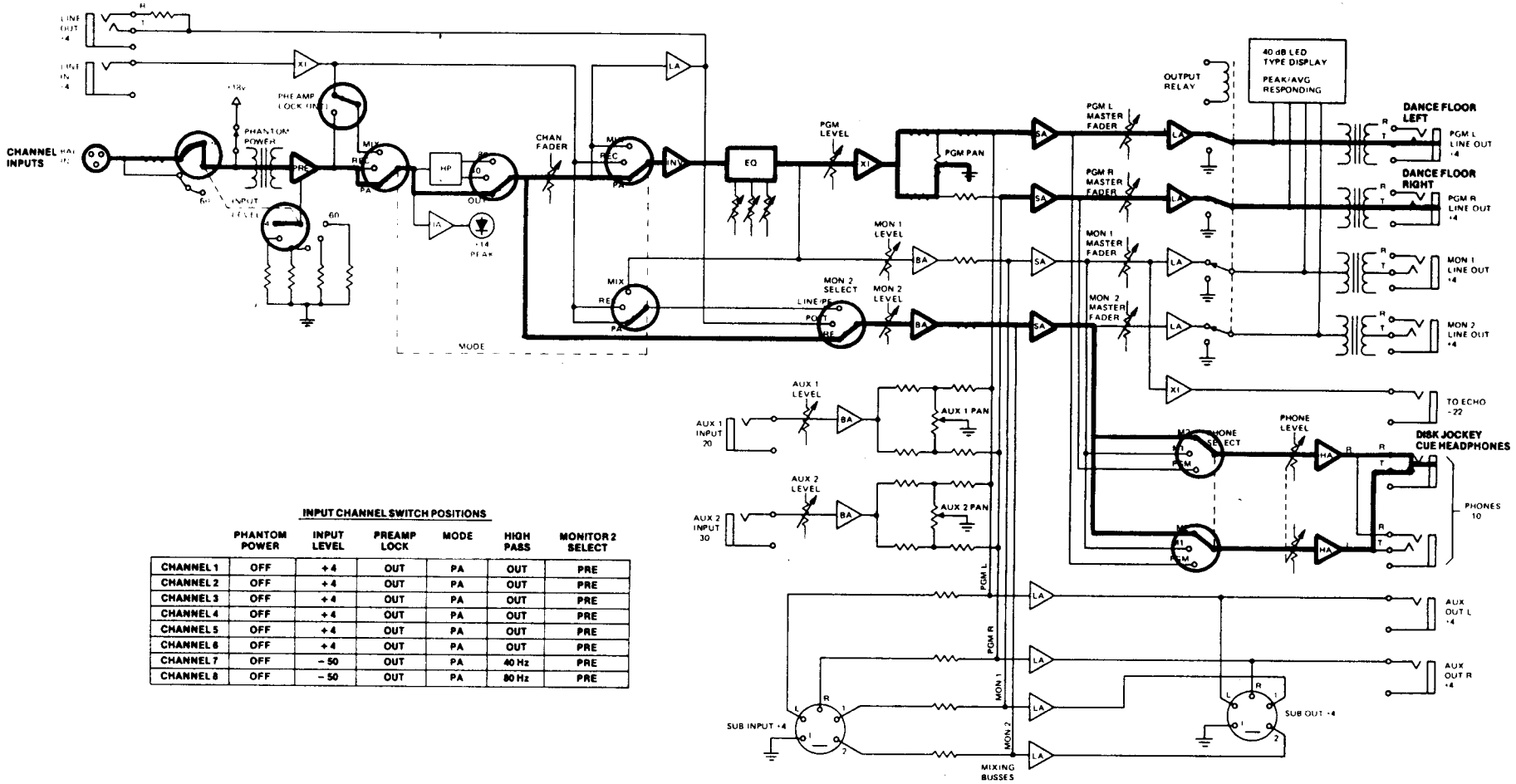
A stereo discotheque system requires a mixing console with *stereo inputs* as well as stereo outputs. That means that a *single* fader must control *both* the left and right outputs from a stereo turntable, for example. In order to accomplish this on the 1690, you must physically couple two of the 1690's Input Channel Faders. This converts two of the 1690's inputs into a single, stereo input. While this might seem like a disadvantage, consider the following:

a) With eight total inputs, the 1690 has room for two stereo turntables (using external RIAA equalized preamplifiers), a stereo tape recorder and two microphones. This should easily fill the needs of a typical discotheque.

b) The 1690 has full three-band equalization on each channel, something only expensive "disco boards" can boast of.

c) The 1690's Monitor 2 system can be used as a pre-fade/pre-EQ "cue" bus to allow the disc jockey to preview a selection before playing it.

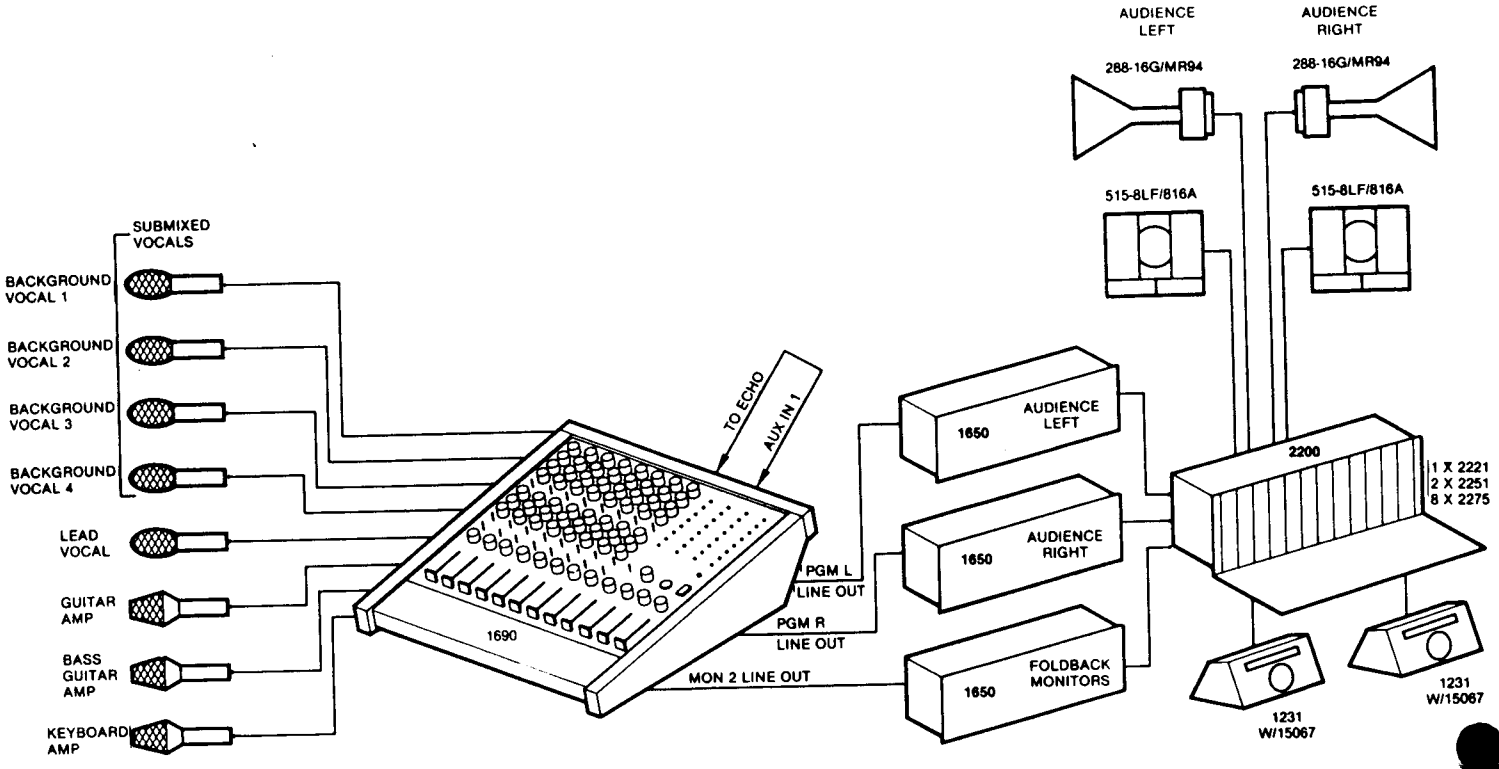
d) Normally, the Program Pan control on Channel 1 would be turned fully left and the Program Pan control on Channel 2 would be turned fully right. This would route the left channel of turntable 1 into the Program Left Mixing Bus and the right channel of turntable 1 into the Program Right Mixing Bus. By manipulating the two Program Pan controls, the disc jockey can mix the left and right channels together for a mono feed, or completely reverse the channels left-to-right, or even do a "panoramic fade" from left-to-right to right-to-left for a special effect.



INPUT CHANNEL SWITCH POSITIONS

	PHANTOM POWER	INPUT LEVEL	PREAMP LOCK	MODE	HIGH PASS	MONITOR 2 SELECT
CHANNEL 1	OFF	+4	OUT	PA	OUT	PRE
CHANNEL 2	OFF	+4	OUT	PA	OUT	PRE
CHANNEL 3	OFF	+4	OUT	PA	OUT	PRE
CHANNEL 4	OFF	+4	OUT	PA	OUT	PRE
CHANNEL 5	OFF	+4	OUT	PA	OUT	PRE
CHANNEL 6	OFF	+4	OUT	PA	OUT	PRE
CHANNEL 7	OFF	−50	OUT	PA	40 Hz	PRE
CHANNEL 8	OFF	−50	OUT	PA	80 Hz	PRE

System Diagram 6B: A Discotheque System Using the 1690



System 7: Internal Submixing with the 1690

This system is set up to show the possibilities for submixing inside the 1690. This could be a setup where there are several background vocals, a single lead vocal and several independent instruments. The 1690 operator can submix the background vocals into a single "submaster" (the Auxiliary 1 input) without losing a single input channel.

Note the following:

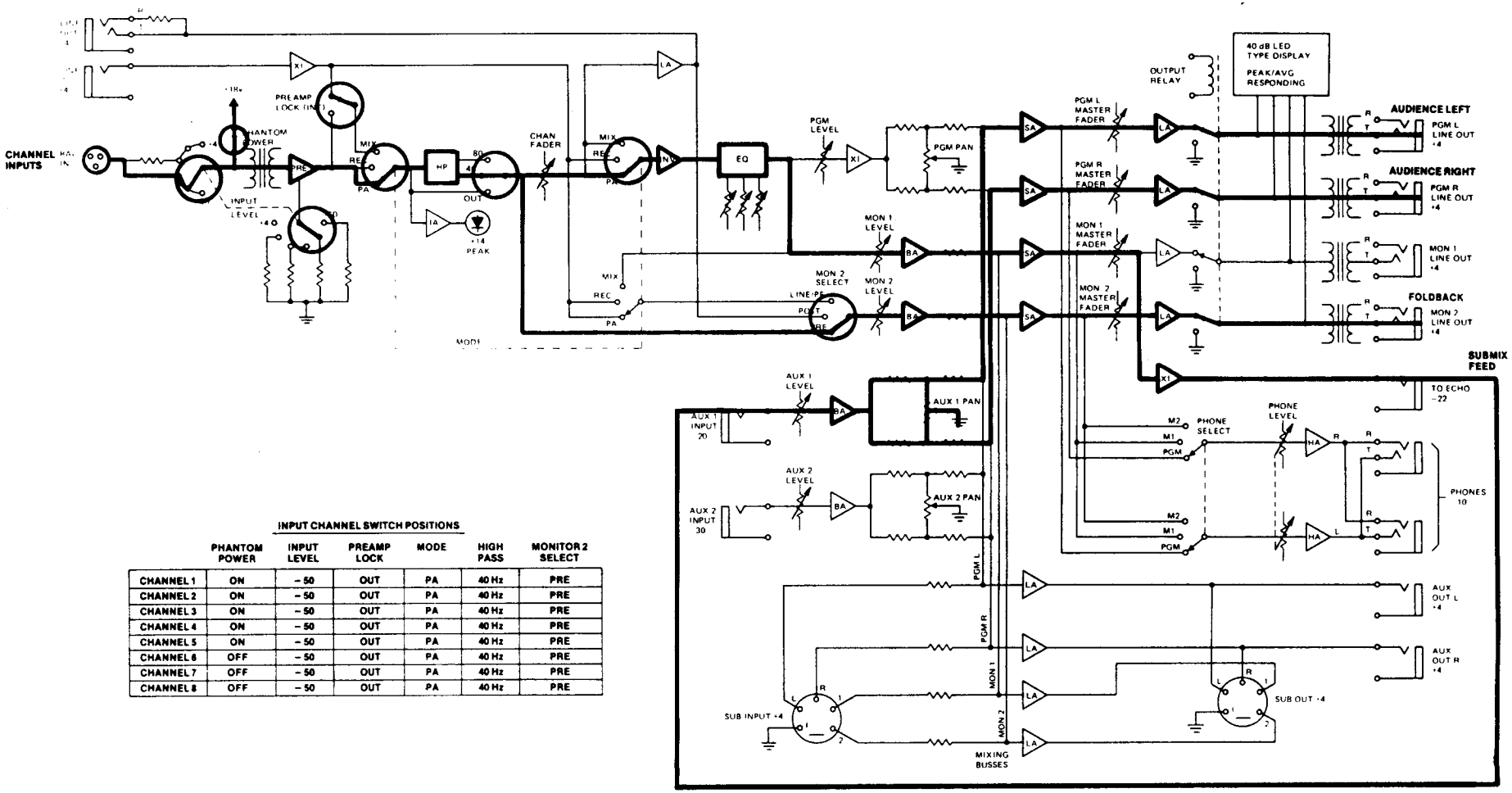
a) The channels to be submixed have their Program Level controls turned fully counterclockwise (all the way down).

b) The Monitor 1 mix becomes the submix through the To Echo output. Normally, the Monitor 1 Level control stay at a constant level and the channel level would be controlled by the Channel Fader.

c) A single phone-to-phone cable routes the To Echo output back into the Auxiliary 1 input.

d) Either the Auxiliary 1 Level control or the Monitor 1 Master Fader can be used as the "submix master"

e) It would be possible to do a second, independent submix via the Monitor 2 system and the Auxiliary 2 input although this would eliminate both monitor channels from actual monitor functions.

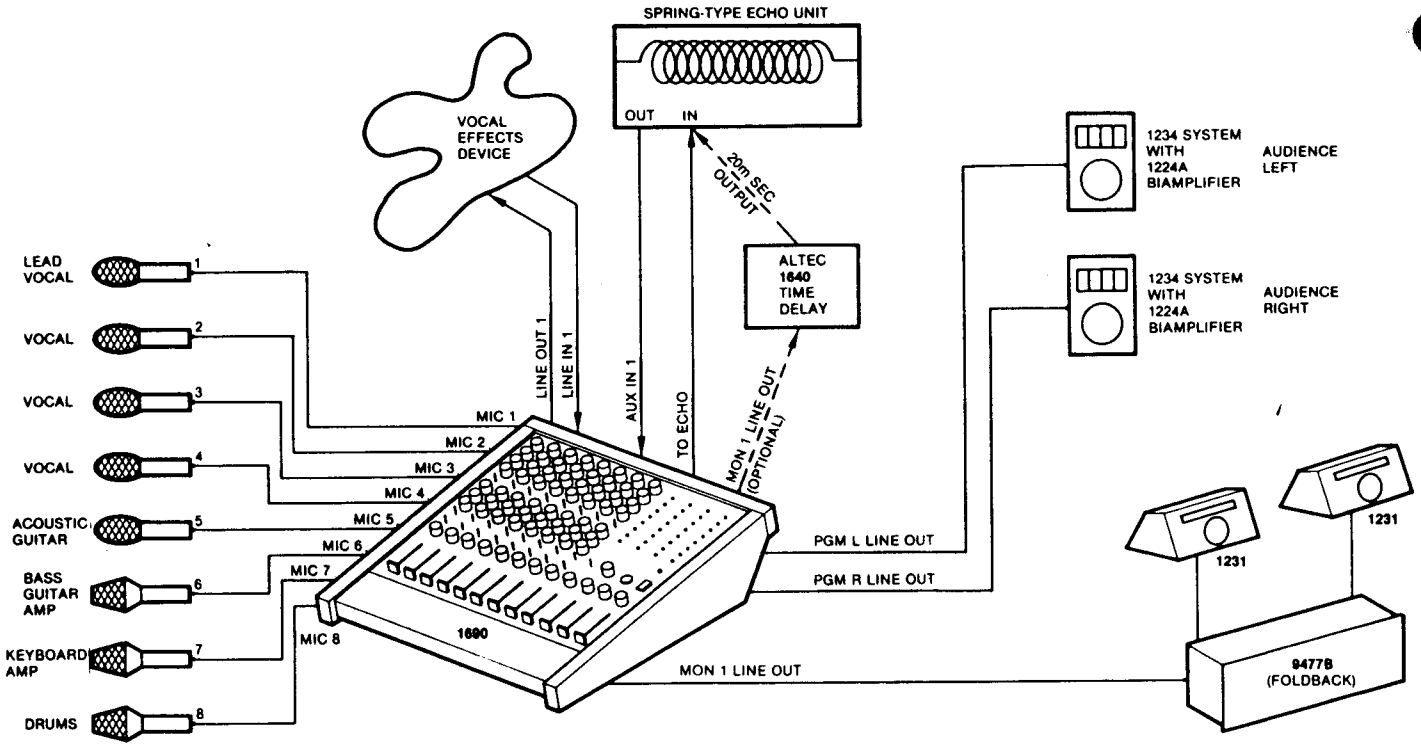


INPUT CHANNEL SWITCH POSITIONS

	PHANTOM POWER	INPUT LEVEL	PREAMP LOCK	MODE	HIGH PASS	MONITOR 2 SELECT
CHANNEL 1	ON	– 50	OUT	PA	40 Hz	PRE
CHANNEL 2	ON	– 50	OUT	PA	40 Hz	PRE
CHANNEL 3	ON	– 50	OUT	PA	40 Hz	PRE
CHANNEL 4	ON	– 50	OUT	PA	40 Hz	PRE
CHANNEL 5	ON	– 50	OUT	PA	40 Hz	PRE
CHANNEL 6	OFF	– 50	OUT	PA	40 Hz	PRE
CHANNEL 7	OFF	– 50	OUT	PA	40 Hz	PRE
CHANNEL 8	OFF	– 50	OUT	PA	40 Hz	PRE

System Diagram 7B: Internal Submixing with the 1690

SYSTEM DIAGRAM 8A



System 8: Effects Devices and the 1690

Common effects devices would include echo and reverberation devices, compressor/limiters, time-delay units and vocal doublers, as well as a host of instrumental-type effects devices. There are two methods of using the 1690 with external effects devices; on individual channels and on the 1690 as a whole.

Note the following on these diagrams:

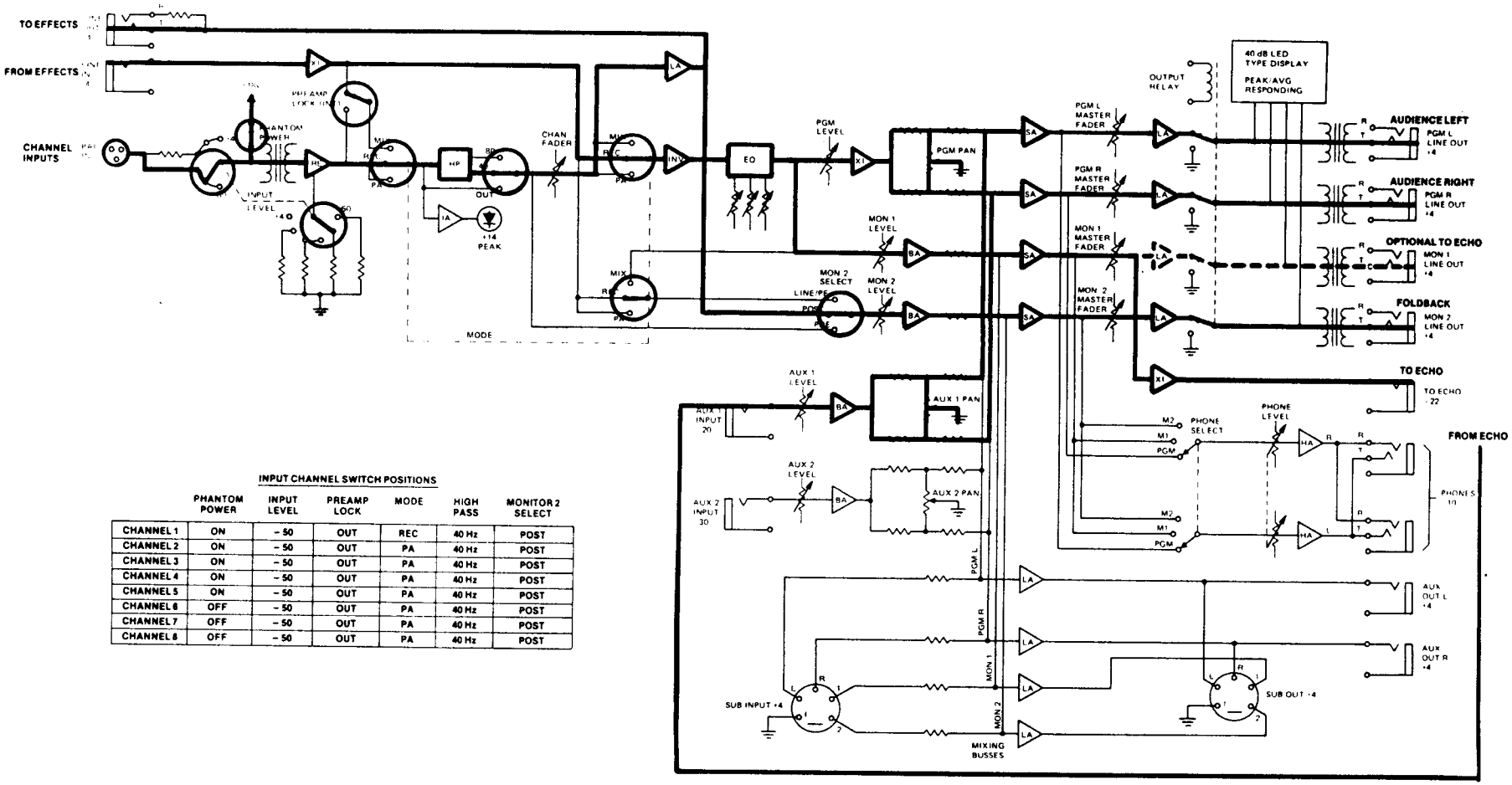
a) The REC mode allows the use of an effects device on a single input channel. This means that this device will affect *only* that channel.

b) Switching the input channel MODE switch from REC to PA switches the effects device "in" and "out" of the circuit.

c) Overall effects are fed from the Monitor 1 mix via the To Echo output (or the Monitor 1 output for high-level effects devices). The output of this effects device feeds the 1690's Auxiliary 1 or Auxiliary 2 input where it is mixed back into the Program Left and Right Mix Buses. Thus, the overall effects are not stereo for this setup; the same effects mix is fed back into both the Program Left and the Program Right Mixing Bus. A stereo effects mix could be done via the Monitor 1 and Monitor 2 outputs feeding back into both the Auxiliary 1 and Auxiliary 2 inputs.

d) Since this system feeds the effects device through the 1690's To Echo output (Monitor 1 Mix Bus), a separate mix can feed the effects device. This means that only those channels that require the effect will receive it.

e) The Monitor 1 system is post-fade/post-EQ. This means that the level fed to the effects device will vary with the setting of the Channel Fader and the Channel Equalization controls. For a pre-fade/pre-EQ or post-fade/pre-EQ effects mix, use the Monitor 2 system.



INPUT CHANNEL SWITCH POSITIONS

	PHANTOM POWER	INPUT LEVEL	PREAMP LOCK	MODE	HIGH PASS	MONITOR 2 SELECT
CHANNEL 1	ON	-50	OUT	REC	40 Hz	POST
CHANNEL 2	ON	-50	OUT	PA	40 Hz	POST
CHANNEL 3	ON	-50	OUT	PA	40 Hz	POST
CHANNEL 4	ON	-50	OUT	PA	40 Hz	POST
CHANNEL 5	ON	-50	OUT	PA	40 Hz	POST
CHANNEL 6	OFF	-50	OUT	PA	40 Hz	POST
CHANNEL 7	OFF	-50	OUT	PA	40 Hz	POST
CHANNEL 8	OFF	-50	OUT	PA	40 Hz	POST

System Diagram 8B: Effects Devices and the 1690

CONCLUSION

Versatility, flexibility, adaptability — whatever you want to call it, the 1690's got it. After using the 1690, we think you will agree that the 1690 has more flexibility and more functions per dollar than any conventional mixing console in its size and price range.

The secret to the 1690's capabilities is the ability to alter its block diagram. In a deceptively simple operation, using the Input Channel MODE switch, you can convert the 1690 from a mixing console optimized for sound reinforcement into a mixing console optimized for recording, or for mixdown or for just about any type of system you may dream up.

If you're a system designer, the 1690 can make your system designs easier and your finished systems more flexible. If you're an end user, the 1690 can give you the kind of operational flexibility you'd expect from a much larger, more expensive mixing console. For sound reinforcement systems, recording or mix down systems, broadcast systems or discotheque systems take advantage of the 1690. It's capabilities can give you simplified, no-compromise solutions to mixing problems in many different applications.